

Hydromap/Mpe

User's Guide

Draft Copy

July 25, 2002

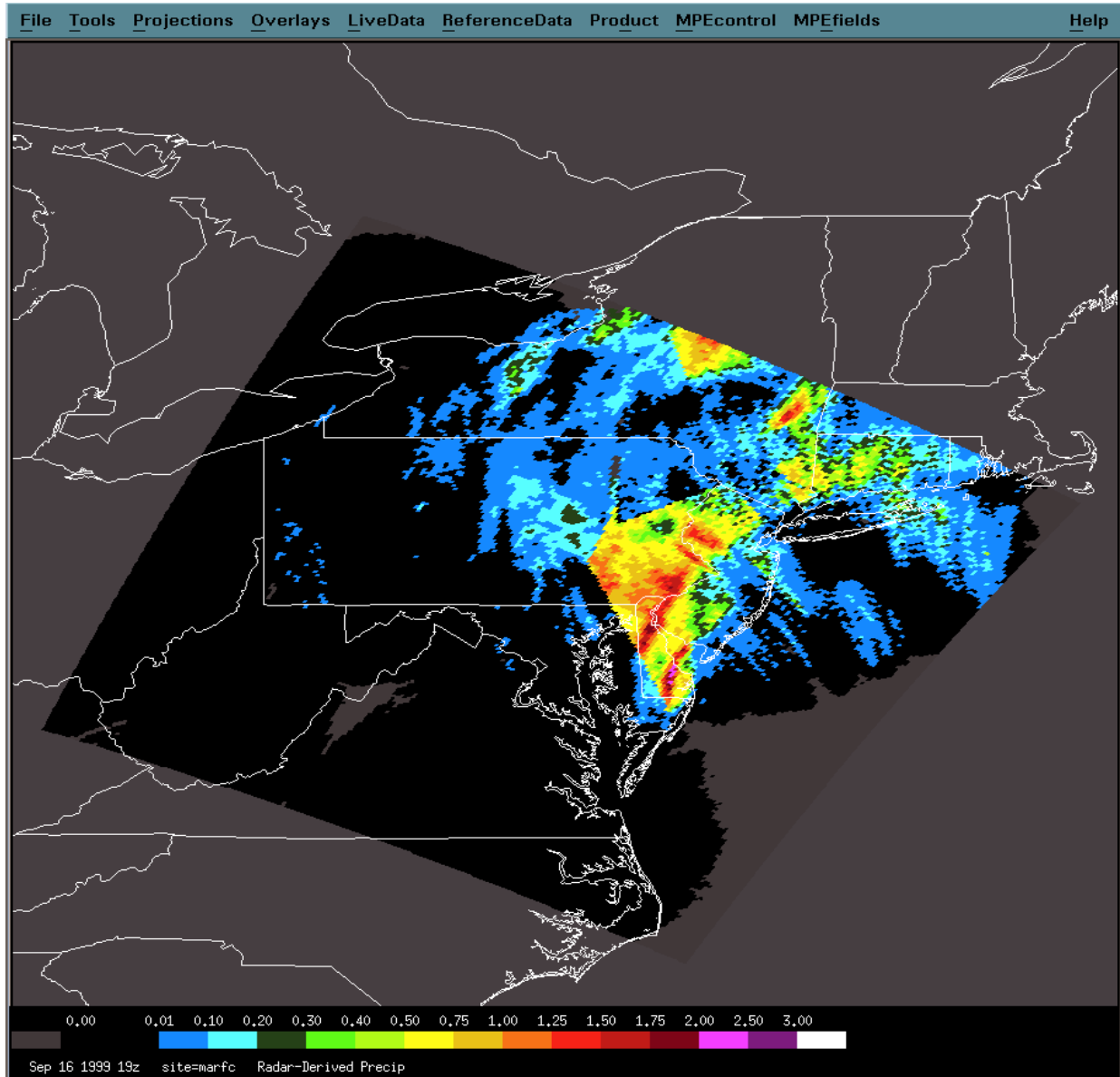


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I. Introduction

The **Hmap-Mpe** application is the result of an effort to consolidate the Hydroview and Mpe programs into a single, versatile utility that can be used at both RFCs and WFOs. Hydroview's focus is primarily on the display of point hydrometeorological data such as river and stream gage readings, precipitation amounts, and similar environmental information that is typically observed and forecast for a specific location. It assists in the preparation of hydrologic forecasts by allowing the user to display and edit this data as well as station reference information such as river action and flood stages, historic river crests, emergency contacts, river rating curves, and dam catalogs.

MPE's focus is on areal estimations of rainfall amounts based on both remote sensing techniques (radar, satellite) and actual observations (rain gages). It creates hourly, gridded, multi-sensor precipitation estimates on a 4-km HRAP grid. The primary inputs to MPE are the gridded Digital Precipitation Array (DPA) products, which provide radar estimates on a 4-km grid, and precipitation gage data. The main steps involved in creating the multi-sensor estimate include creating a multi-radar mosaic, determining a mean field bias adjustment, and merging the grids with precipitation gage observations. One of the important features of MPE is the ability to edit the gridded data fields as well as the point gage observations. In the process of performing these operations, multiple types of precipitation grids are generated, with one of these designated as the "best" grid. This resulting grid is then used to produce MAPX time series for input into NWSRFS and for use in WHFS.

The combination of these two programs provides the forecaster with the ability to interactively monitor multi-sensor rainfall estimates, detailed point data, and flash flood guidance.

An attempt was made to preserve as much of the original functionality of Hydromap and MPE as possible. Inevitably, a few new features have been added to make the marriage of these two programs more seamless and useful. These are described in detail below. Note that it is assumed that the reader of this document is already somewhat familiar with the behavior of the Hydroview and MPE programs. Even so, all features, even those that were not modified will be covered in some detail.

II. The New Appearance of Hmap-Mpe

When Hmap_Mpe is started, a pop up information dialog keeps the user informed of the progress of the initialization of the application. In this build, the initialization has been broken down into the definition of Hmap_Mpe display variables, the collection of point data from the database, and the instantiation of Mpe Data from the database and assorted flat files. This dialog box automatically "self-destructs" once the main window is successfully displayed.

The appearance of the main window of the Hmap_Mpe application is essentially the same as that of Hydroview. The most obvious difference is that the menu bar across the top of the main window now features two additional menu items: **MPEcontrol** and **MPEfields**. These

contain the MPE-relevant controls and sub windows. Unlike MPE which immediately prompted the user to select a hour for which to display multi-sensor precipitation data, the user must now go under the **MPEcontrol** menu and select **Choose Hour** in order to display MPE data on the screen. Until this is done, all of the items on these two menus remain desensitized and inaccessible. Basically, until an hour for which to display MPE data is chosen, Hmap-Mpe is in standard Hydroview “mode”.

Some emphasis should be placed on “mode”. While Hmap-Mpe is a union of Hydroview and MPE, this joining is not equal. Hydroview options and subwindows are always accessible regardless of whether or not Mpe data is being displayed. However, the Mpe portions of the program can be collectively toggled “on” by selecting **Choose Hour** under **MPEcontrol** and toggled “off” by selecting **Clear Data**, also located under **MPEcontrol**.

A. What’s New?

1. Mpe Menu Reorganization

With the merging of these two applications came the task of combining all of the menu options from Hydroview and MPE. The **Overlays** and **Help** menus already existed in both applications so little work was required here. Since MPE is subordinate to Hydroview, the decision was made to preserve the Hydroview menus and consolidate the remaining MPE menus, **Control, Radars, Gages, Options, Fields, and Edit Precip** into the **MPEcontrol** and **MPEfields** menus on Hmap_Mpe. Below is a table mapping the original MPE menu items to their destination menu items on Hmap_Mpe:

MPE	Hmap_MPE
Control:NextHour	MPEcontrol:Next Hour
Control:Previous Hour	MPEcontrol:Previous Hour
Control:Choose Hour	MPEcontrol:Choose Hour
Control:Save Data	MPEcontrol:Save Hour’s Data
Control:Rerun FieldGen	MPEcontrol:Rerun FieldGen
Control:Quit	File:Close
Radars:Show Single Radar Site	MPEcontrol:Show Single Radar Site
Gages:Show Gage Table	MPEcontrol:Gage:Show Gage Table
Gages:Show Gage Identifiers	MPEcontrol:Gage:Show Gage Identifiers
Gages:Show Gage Values	MPEcontrol:Gage:Show Gage Values
Overlays:States	Overlays:States

Overlays:County
Overlays:Cities/Towns
Overlays:Basin boundaries
Overlays:Rivers
Overlays:Radar Umbrella
Options:Time Lapse
Options:Zoom
Options:Add Pseudo Gage
Options:Display Bias Table
Fields:RMosaic
Fields:BMosaic
Fields:MMosaic
Fields:LMosaic
Fields:GageOnly
Fields:xmrg
Fields:Height
Fields:Index
Fields:LocSpan
Fields:LocBias
Fields:Prism
Fields:Satellite Precip
Edit Precip:Draw Polygons
Help
Not in Menu of Original Version
Not in Original Version
Not in Original Version

Overlays:County
Overlays:Cities/Towns
Overlays:Basin Boundaries
Overlays:Major Streams/Lakes
Overlays:Radar Rings
MPEcontrol:Time Lapse
Tools:Zoom
MPEcontrol:Gage:Add Pseudo Gage
MPEfields:Display Bias Table
MPEfields:Radar Mosaic
MPEfields:Field Bias Radar Mosaic
MPEfields:Multisensor Mosaic
MPEfields:Local Bias Radar Mosaic
MPEfields:Gage Only Analysis
MPEfields:Best Estimate QPE
MPEfields:Height Field
MPEfields:Radar Coverage Field
MPEfields:Local Span
MPEfields:Local Bias
MPEfields:Prism
Not Mapped
MPEcontrol:Draw Polygons
Help
MPEfields:Display 7x7
MPEcontrol:Clear Data
MPEfields: Multi-Hour QPE

The above table illustrates that of all of the MPE menu options, only the Satellite Precipitation option has not been carried across into Hmap_Mpe. It also shows that there are two new menu items, one under **MPEcontrol (Clear Data)** and one under **MPEfields (Display 7x7)**. These will be discussed in more detail below.

2. Changes Made to MPE Functionality

a. Show Single Radar Site

Hmap_Mpe only allows the display of one Show Single Radar Site window at a time while the original MPE allowed the display of several such windows simultaneously. This single window limit has been imposed to avoid potentially serious memory problems which could degrade the performance of the application or even lead to it crashing. Concern has been expressed that the field may want the ability to launch several single radar sites windows simultaneously, and once the dust settles, options will be investigated to allow this to be done in a manner that preserves the integrity of the program.

b. Show Gage Identifiers / Show Gage Values

These options have been modified slightly to ensure that when selected, the gage values and identifiers remain displayed while zooming or panning across the map. It also ensures that the gage data remains displayed even when selecting another product or selecting a new product time. The menu items for the gage identifiers and values are now toggle buttons which represent the state of these overlays. To clear the display of the gage values and gage identifiers, the user must select their corresponding gage menu items to toggle them off. Gage data is cleared along with any other displayed MPE data if **Clear Data** is selected under **MPEcontrol**.

c. States, County, Cities/Towns, Basin Boundaries, Rivers

The sources for these overlays, in both the main and single windows, are no longer the files in the precip_proc geo_data directory. The state and county boundaries are read from FSL's binary cartographic data (BCD) files. The cities and town information is retrieved from the FSL cities.lpi file which has been localized for the forecast site the application is being run at. The basin boundary and river data are taken from the geoarea and geoline tables, respectively, in the hydrological database.

d. Time Lapse

For the most part, the time lapse remains unchanged in Hmap-Mpe. However, some new functionality has been added to how the mouse interacts with the time lapse. In the original MPE, a single click of any of the mouse buttons ended the time lapse. In Hmap_Mpe, a single click of the left or middle mouse button will end the time lapse, but the right mouse button is reserved for displaying a pop menu and will not have any effect on the time lapse. In addition to ending the time lapse, a middle mouse button click will also zoom into the map, giving the user the ability to inspect in greater detail a portion of the image of interest.

Likewise, a left mouse button click will end the time lapse and zoom out of the map. If the user wants to end the time lapse without zooming, the **End Loop** item on the **Time Lapse** menu must be chosen

Another feature of the time lapse on Hmap-Mpe which is anticipated to prove very useful is the ability to time lapse in any zoom scale while centered on any portion of the HRAP grid.

e. Draw Polygon

Some minor modifications have been made to the draw polygon functionality. Stricter checking is performed by Hmap-Mpe to ensure that the user cannot place any of the vertices of the polygon outside of the HRAP grid box. A warning message stating that the bounds of the forecast site's HRAP grid have been exceeded is displayed in a pop up dialog box. Once the user selects "Ok" on this dialog box, the drawing of the polygon may be continued provided that the user is careful to draw within the HRAP grid area. Note that all areas outside of the site's HRAP grid are shaded in gray on the hmap_mpe display. Also, as a source of guidance, the actual HRAP grid may be displayed by selecting the HRAP option under the Grids item on the Overlays menu.

The appearance of the Edit Precipitation subwindow has been altered slightly as well. The fields have been reordered and the substitute precipitation value option has been prepended with a radio box like all of the other precipitation source options. When the box for the option to substitute a precipitation value is checked, the slider bar is sensitized, and it can be used to set the substitute precipitation value. When this box is not checked, then the slider bar is desensitized.

f. Radar / Precipitation Mosaics

The radar / precipitation mosaics remain unchanged. However, in Hmap_Mpe the names of these items on the MPEfields menu have been expanded to make them more understandable and intuitive. For example, under the **Fields** menu on MPE, the menu item used to select the radar mosaic was named **Rmosaic**. On the Hmap-Mpe application under the **MPEfields** menu item, the new menu item is called **Radar Mosaic**. Because it has not yet been completely implemented, Hmap_Mpe does not include the **Satellite Precip** option on the **MPEfields** menu. This will be added when this precipitation estimation option becomes available. See the above table for a complete mapping of all of the original Mpe field names to the new Hmap-Mpe names.

g. Clearing the Mpe Data

This option is new to the Hmap_Mpe application. As described above, the MPE portion of Hmap_Mpe is subordinate to the Hydroview portion. Along this line of thinking, the option to toggle on and off the "MPE" portion of the application has been added in the form of the **Clear Data** menu option item underneath the **MPEcontrol** menu. When the **Clear Data** item is selected, all of the options on the **MPEcontrol** and **MPEfields** menus are desensitized with the exception, of course, of the **Choose Hour** option under the **MPEcontrol** menu. The

user will not be able to access MPE data until a hour is chosen by selecting **Choose Hour** again.

h. Zooming/Panning/Recentering

Hmap_Mpe provides a large amount of flexibility when it comes to manipulating the orientation of the map display within the viewer. The user has the option to zoom in and out of the map; to pan north, east, south, and west; and to recenter the display on any selectable portion of the map. These map orientating tools are grouped together in three places in Hmap_Mpe:

- The tool bar which is toggled on and off from the **Tool Bar** toggle button on the **Tools** menu or by pressing CTRL+T
- The popup menu made visible by a single click of the right mouse button
- The individual “Zoom”, “Pan”, and “Recenter” options on the “Tools” menu

It is hoped that this redundancy in these key controls will satisfy the preferences and styles of most users. It is important to note here that the MPE methodology for zooming where the user would first draw a rectangle and then select the “Zoom” option under the “Options” menu is no longer used. In addition to the above methods for zooming, Hmap-Mpe handles zooming via mouse controls in a fashion that precisely mimics how D-2D works. The following table maps the functionality associated with each of the mouse buttons:

<u>Mouse Button</u>	<u>Functionality that Results</u>
Single Left Button Click	Zoom out and recenter at the click point.
Single Middle Button Click	Zoom in and recenter at the click point
Single Right Button Click	Displays a “pop up” menu near the click point with additional options (see below)
Double Left Button Click	Select a station. A red box will highlight the station that is selected. If a selected station is double clicked on, then it is deselected.
Double Middle Button Click	Select a station and launch the Time Series Control window for it. A red box will highlight the station if it is not already highlighted.

i. Exceptions to Mouse Functionality

When adding a pseudo gage (reached from the **Add Pseudo Gage** item under the **Gages** submenu on the **MPEcontrol** menu), a left mouse click will select the location on the map to place the pseudo gage. To indicate that the mouse is in “add pseudo gage mode”, the mouse pointer changes from an arrow to a hand until the location of the new gage is selected.

When drawing a new polygon (reached from the **Draw Polygons** item under the **MPEcontrol**), a left mouse click draws the vertices of the polygon. A right mouse button click closes the polygon

Zoom mode is disabled when the user chooses **MPEcontrol->Draw Polygons** or **MPE Control->Gage->AddPseudoGage** menu item.

Gage->ShowGageIdentifiers/Values menu options are available in both - regular or zoom mode.

j. Legend

The legend is set up to only show up on the screen when MPE data is actually being displayed. The legend is closed when the MPE data is cleared from the display (“Hydromap mode”).

An important update was made to the original MPE legend. The original functionality of MPE had a right click of the mouse bring up a popup shell that contained information about the point underneath the mouse. This information included the “x” and “y” coordinate and latitude and longitude of the of the HRAP grid underneath the mouse pointer. In order to preserve the Hydromap mouse functionality, all this information was placed in the MPE legend which is displayed across the bottom of the MPE gridded fields. The pop up menu brought up by a right click of the mouse now includes an option to display this geographic and locator information in the legend. The user may turn this additional HRAP grid information in the legend “off” which causes the legend to resize to a smaller height, maximizing the viewing area. The latitude/longitude information was not included in the MPE legend. These values can be accessed via the toolbar displayable across the top of the GUI or the popup menu accessible via a right click of the mouse.

However, the Single Radar Site window preserves original MPE functionality with a right click of the mouse button displaying a “Location Data” window which contains the same information about the point underneath the mouse as the “locator shell” popup window in the original MPE

3. New Features Added to Hydromap

Much of Hydromap has remained relatively unchanged. However, a handful of new features and enhancements have been made to Hydromap and its descendent windows.

a. Radar Rings Overlay

The radar rings overlay has been modified to display only the radar rings that provide coverage over the RFC or WFO area being examined. In addition to this, the color of the rings has been assigned special significance. Each ring may either be red or green. If there is no MPE data being displayed or the MPE data field being displayed contains only missing values, then the radar rings will be red. If non-missing MPE data is being displayed, then radars that contributed data to that image will be drawn with green rings. Conversely, radars that did not contribute data to the image (because their data was never received) will be drawn with red rings.

b. Point Display Control

The point display control GUI has been slightly modified to contain a “Clear Data” button. This button enables the user to disable the display of point data on the Hmap_Mpe viewing area. This is especially desirable when the user wishes to reduce the number of data objects being displayed or when the user is closely analyzing the gridded hourly precipitation fields. Disabling the display of point data from the Point Data Control GUI can have the advantageous effect of speeding up the rate at which the Hmap_Mpe display is redrawn during zooming and panning operations. To reenable the plotting of point data, just select on the “Map Data” button.

c. Areal Display Control

This option has been replaced by the Flash Flood Guidance option. Many of the areal displays are handled by other AWIPS applications. For example, **FFMP** performs comparisons between observed rainfall amounts and Flash Flood Guidance (FFG). The Mpe functionality integrated into Hmap_Mpe handles the display of precipitation estimates derived from radar, gages, and combined radar and gages. With many of the other areal display fields being supported in some fashion by other parts of Hmap_Mpe or other AWIPS applications, the decision was made to eliminate the areal data display control altogether. Flash flood guidance products are the only areal products that needed to be accommodated in some fashion by Hmap_Mpe.

d. Flash Flood Guidance

Hmap_mpe has the capability of displaying Flash Flood Guidance (FFG) grids at either the WFO or RFC level of spatial resolution. The FFG display GUI is accessed from the "Flash Flood Guidance" option under the "LiveData" menu. This simple user interface gives the forecaster the ability to choose FFG data based upon its source and duration. The FFG data is displayed on a HRAP grid or as an averaged value over basins.

The areal coverage of the FFG data is chosen by the "FFG Area" option menu button at the top of the GUI. This button offers two choices, namely "WFO" and "RFC", with "WFO" being the default. The "Id" and "Dur" option menu buttons, which are located just below the list box, allow the user to filter by a specific "WFO" or "RFC" FFG product site and product

duration , respectively. The “Display As” option menu, which is collocated with the “Dur” and “Id” options gives the choice of displaying the FFG data as a HRAP grid or as basin averages. Note that the ability to filter by site is only available for RFC FFG fields. The ability to filter by duration and to display the data as either a HRAP grid or as basin averages is available for both RFC and WFO FFG fields.

Available FFG data for the user-specified combination of area, creation site, and duration are listed in the scrolled list box which occupies the top third of the GUI. Each entry in the list box contains the identifier of the WFO or RFC the FFG pertains to, the duration of time the FFG product is applicable for, and a time stamp ranging from year to minute representing the creation time of the data. FFG data may be selected by double clicking on a FFG item in the list box or by clicking on the "Select" button in the middle of the FFG GUI.

Each time a new FFG field is chosen for display, the legend at the bottom of the FFG GUI is updated to reflect the time, origin, duration, and color levels of the data. The FFG product has 9 color levels representing distinct rainfall accumulation categories. These categories are as follows:

- Missing
- less than 0 inches
- 0 inches
- greater than 0 but less than 1.00 inch
- greater than or equal to 1 inch but less than 2 inches
- greater than or equal to 2 inches but less than 3 inches
- greater than or equal to 3 inches but less than 4 inches
- greater than or equal to 4 inches but less than 5 inches
- greater than or equal to 5 inches

FFG data may cleared from the display by selecting the "Clear" button which resides in the middle of the FFG GUI. The FFG GUI may be closed by clicking on the "Close" button at the bottom of the GUI.

Note that when viewing the FFG data as an averaged value of a basin, the basin must be a minimum percentage of HRAP bins containing valid, non-missing FFG values in order for it to be assigned the average of these values. If there are too many missing or invalid values or if a large portion of the basin is outside of the HRAP grid defining the site, then the basin will be assigned a color indicating that the data for it is missing.

e. Station Selection Using the Mouse

The user may still select a station on the display by double clicking on it with the left mouse button. This will result in a red box being drawn around the selected station. Functionality has been added to Hmap_Mpe to allow the user to deselect a selected forecast/observation point on the display. This is simply done by double clicking with the left mouse button on the selected item. This will turn off the red rectangle.

III. The Hmap_Mpe Graphical User Interface

This section of the document describes in greater detail all of the various utilities available through the drop-down menus displayed across the Hmap_Mpe main window.

A. The Main Window

The Main window is the first window which appears when the application is opened, and it is the primary controlling window for the Hydromap_Mpe process. This simple window consists of a main menubar across the top and a large display area. The user has great control over what is displayed in display area. **By default, state boundaries, rivers, reservoirs, and Hydromap point data are displayed in the display area when the application is first started.** But the user can set which overlays are shown during the execution of the application by selecting the various overlay options under the “Overlays” menu. Also, the user has the ability to modify the initial overlays displayed by editing the overlay configuration file. This is described in more detail in the accompanying *Hmap_Mpe Systems Document*. Note that by default, MPE data is not shown when Hmap_Mpe is first launched.

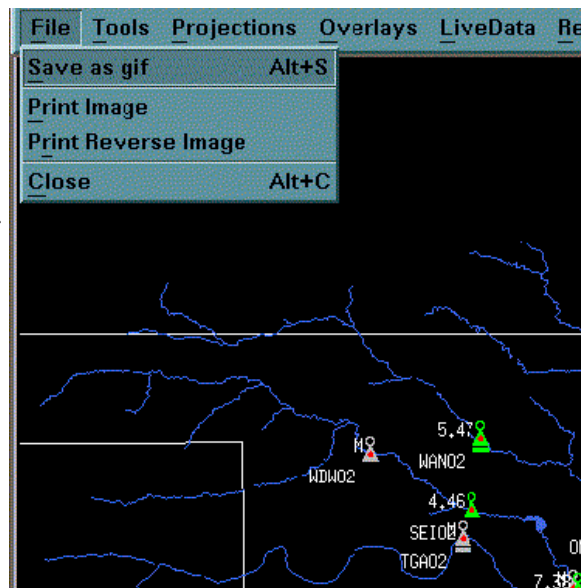
B. The Main Menubar

The menubar which spans across the top portion of the Hmap_Mpe viewer shows the following menu headings, listed from left to right: **File, Tools, Projections, Overlays, LiveData, ReferenceData, Product, MPEcontrol, and MPEfields**. Utilities are logically grouped by function under these menu headings. Each of these drop down menus is described in detail below.

1. File Menu Options

The File sub-menu has the following available options: **Save as Gif, Print Image, Print Reverse Image, Close.**

a. **Save as Gif** - Launches a popup dialog which allows the user to capture the current Hmap_Mpe display and save it as a gif formatted file. It is up to the user to make sure that nothing is obscuring the Hmap/Mpe viewing area before pressing “Ok” on this dialog box. Any windows that obscure or overlap the Hmap_Mpe viewing area will be captured and become part of the resulting GIF, which can be annoying to say the very least. The user must make certain that the filename chosen to save the GIF image under has the extension “*.gif”. If it does not, an error will result. **Note that this option is different than the “Save Hour’s Data” option on the**



MPEcontrol menu. The “Save Hour’s Data” option does not allow the user to specify a name for the GIF file. Also, a gif image is only generated by it when the “mpe_save_gif” token is set to “save”.

b. Print Image - This option will perform a screen capture of the current Hmap_Mpe display and output the resulting image to the printer. Currently, color printing is only supported for the HP platform. In order to print an image to a specific printer, the user must take care to properly set the following tokens:

whfs_printcommand_HP - If running on HP-UX, this token must be set to contain the full print command including the user-desired destination. For example, to print the image out to lp3, the whfs_printcommand_HP token should be set to something like “**lp -dlp3**”. This token defaults to value “**lp**”.

whfs_printcommand_LX - If running on Linux, this token must be set to contain the full print command including the user desired destination. For example, to print the image out to lp2, the whfs_printcommand_LX token should be set to something like “**lp -dlp2**”. This token defaults to value “**lp**”.

Color printing is currently supported only on the HP. If a color image is desired, then set **whfs_print_color** token to **YES**. Make certain that the **whfs_printcommand_HP** token is set to a valid color printer. Otherwise, the results will be less than desirable.

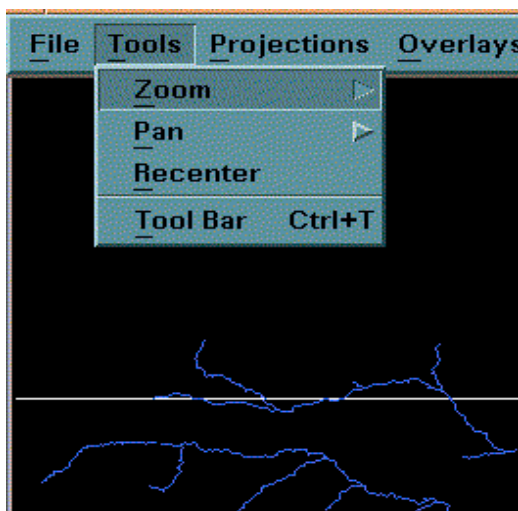
c. Print Reverse Image - This option will perform a screen capture of the current Hmap_Mpe display and output the resulting image in reverse video to the printer. Currently, color printing is only supported for the HP platform. In order to print an image to a specific printer, the user must take care to properly set the tokens outlined in the section above entitled **Print Image**.

d. Close - This option will close the application.

Tools Menu Options

The choices of Tools sub-menu are **Zoom**, **Pan**, **Recenter**, and **Tool Bar**.

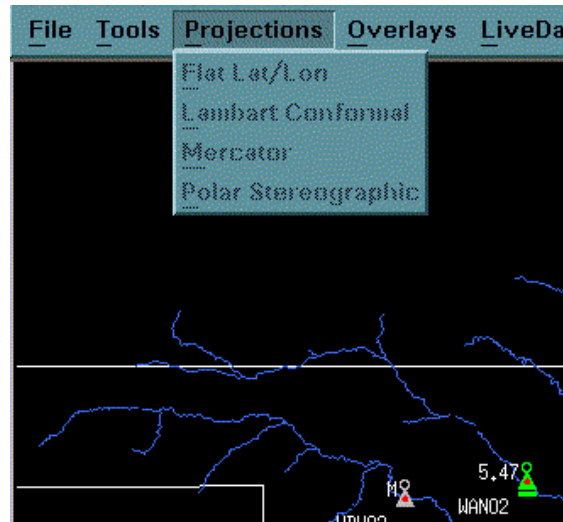
a. Zoom - Selecting **Zoom** brings up a small menu with the options “In” and “Out” on it. “In” zooms into the map. “Out” zooms out of the map. Note that unlike Mpe_Gui, a zoom rectangle no longer needs to be drawn to select an area to display.



b. Pan - Selecting this option brings up a small menu with the options “Up”, “Down”, “Right”, and “Left” on it. These options allow the user to easily navigate around the map, a feature which did not exist in Mpe_Gui.

c. Recenter - Selecting this option changes the mouse pointer to a leftward pointing hand. A single left mouse button click on the Hmap_Mpe display while in this mode will recenter the map display around that point on the map.

d. Tool Bar - This option is a toggle button which enables or disables the display of the application’s toolbar. This toolbar by default is “off”. When it is enabled through this menu option, it is displayed just below the main menubar. This toolbar contains the following items from left to right: the pan up button, the pan down button, the pan left button, the pan right button, the recenter button, the zoom in button, the zoom out button, the latitude box, and the longitude box. These buttons offer an alternative means of accessing the map zoom, recenter, and pan functions.



Available Overlays

- All Streams / Lakes
- Major Streams / Lakes
- Basin boundaries
- Counties
- County Warning Areas
- RFC boundaries
- States
- Zones
- Cities / Towns
- Highways / Roads
- Grids
- Lat / Lon lines
- Time zones
- Radar Locations

3. Projections Menu Options

The projections menu is currently not implemented. When developed, it will offer the ability to switch between several different map projections to use in plotting and viewing the Hmap_Mpe data.

4. Overlays Menu Options

The **Overlays** menu contains toggle buttons which can be used to enable or disable the display of the various overlays offered on the Hmap_Mpe application. The overlays are drawn on top of the spatial data such as the precipitation fields and the FFG grids. It should be noted that while it is possible to display multiple overlays at once, doing so

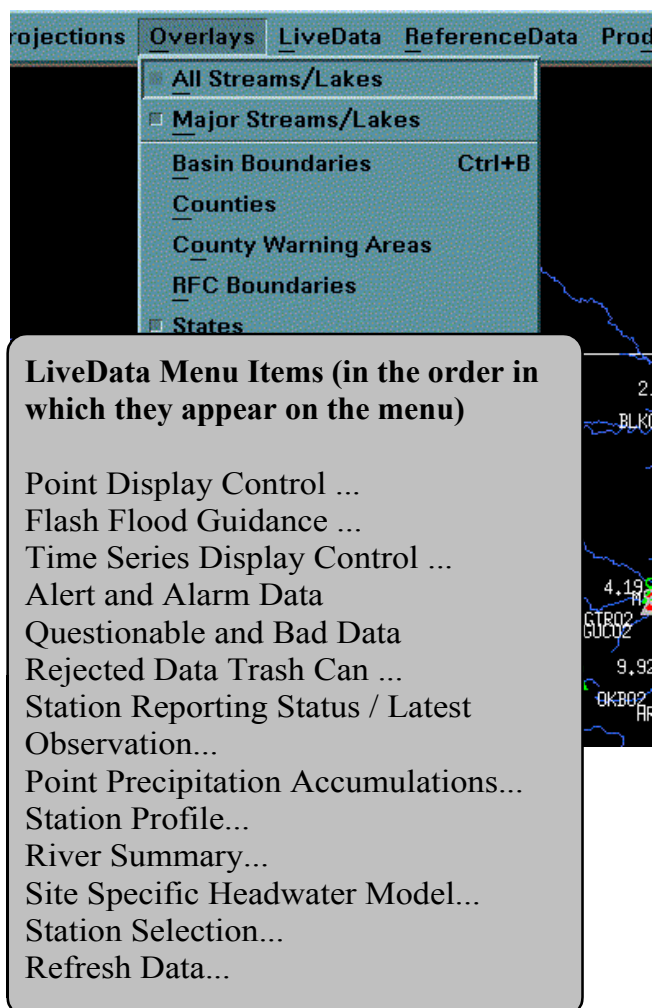
results in a reduction of the resources available for other applications running on the computer. It also results in an increase in the amount of time needed to redraw the hydrologic data when a display altering operation such as zooming or panning is performed.

The application is setup such that one of two forms of streams and lakes information is always displayed. The “All Streams/Lakes” and the “Major Streams / Lakes” options on the Overlays menu are configured as radio buttons enforcing that either one or the other must always be visible. By default the Major streams / Lakes overlay and the state boundaries overlay are displayed when Hmap_Mpe is first started.

Overlays remain displayed when changing hours. The color coding of the radar rings is updated when changing hours, but it is not updated during a time lapse.

The management of the overlays and their sources has migrated away from the database and now relies more heavily upon the **hmap_mpe_overlay_configuration** file located in hydroview’s local data apps directory. There is basically one row per overlay in this file, and each row contains information that controls how that particular overlay is displayed, its default state upon startup of the application, whether or not it is stored in memory, and its source. Individuals are discouraged from modifying this file unless they really have to. The format is sensitive, and mistakes could result in run time errors of the application.

The power in the overlay configuration file is that it allows a user to switch overlay sources and properties with relative ease. For example, Hmap_Mpe overlay configuration file can be set up to use town and city data from the geodata sets, the WHFS City database table, or the FSL cities and towns lpi files. Suffice it to say at this point that the overlays used by Hmap_Mpe come from several different sources which in

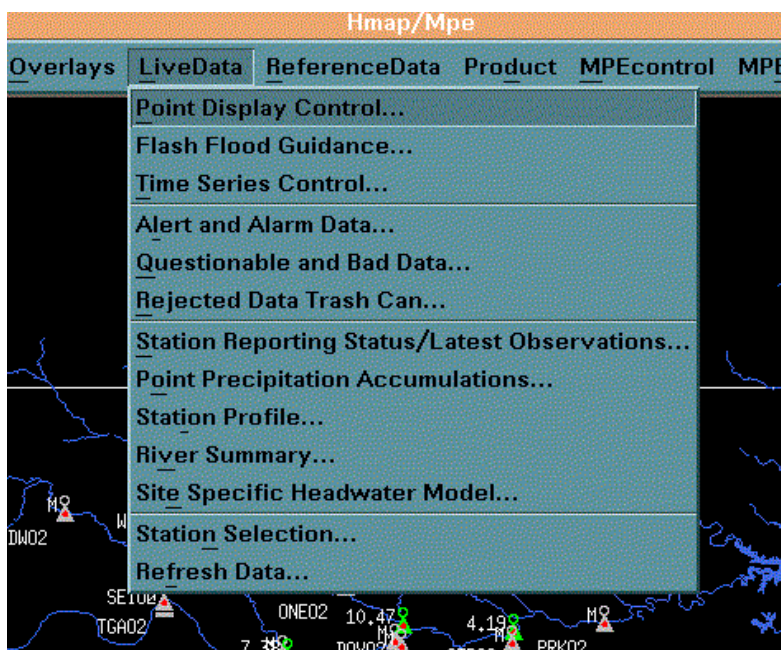


turn have multiple formats that the program needs to be able to recognize and interpret. The overlay configuration file provides an efficient mechanism of informing the application where it needs to retrieve its overlay information from. The specific format of the overlay configuration file is covered in greater detail in the *Hmap_Mpe Systems Document*.

5. Live Data Menu Options

Much of the real, hardcore functionality of the Hmap_Mpe application is contained within the **LiveData**, **ReferenceData**, **Product**, **MPEcontrol**, and **MPEfields** menu items. The **LiveData** menu is a child of the original Hydroview application. As such, it really has not changed a great deal from its carry over to Hmap_Mpe.

a. Point Display Control



The Point Display Control option provides a means of displaying forecast and observed data for specific locations in both a tabular and a graphical format. The point data displayed generally consists of one value per station.

The control over the data selections is based on selecting the data as per its SHEF attributes. What follows is a brief overview of how the Point Display Control option works. This option covers a broad range of functionality, and the

reader is encouraged to visit http://www.nws.noaa.gov/oh/hod_whfs/Hydroview/hydroview.htm where a PDF version of the Point Display Control documentation may be retrieved.

1. Physical Element (PE) and Type Source (TS) Selection

On the Point Control GUI, the physical elements are grouped into the categories of “River”, “Rain”, “Snow”, “Temp”, and “Other”. Each of these elements may be selected, in turn, by clicking on the radio box adjacent to it. This selection defines which database PE table(s) to use when displaying the point data. The type source represents where the data for

the physical element being processed is being retrieved from or how it is being transmitted from the observation site to the point where it is being decoded and stored. The type source is only used in filtering point data from the database when the check box labeled "TypeSrc" is checked. Note that whenever the primary element selection is changed, both the PE (Physical Elements) and TS (Type Source) scrolled lists are automatically updated regardless of the TypeSource check box being checked.

For the selected primary element this list gives the unique SHEF-based PE entries available in the database table(s) associated with the selected element, as defined by the IngestFilter. For the selected element and given PE, the type source list gives the unique SHEF-based TS entries as defined by the IngestFilter.

2. Selection of the Data time reference

The time window for which Point Control data is retrieved depends on the value of the three time reference fields, all of which work together to determine the time window and the manner in which this time window is used. These three time fields are described below.

3. Time mode

The time mode is specified as either the latest time, a set time, the minimum or the maximum. When latest is selected for non-precipitation requests, the program only considers data that are within the last N hours, where N is the hours value defined in the text field "Hrs". For precipitation requests, the top of the latest hour is used, and N is the duration.

When set time is selected for non-precipitation requests, the program looks for data in the time window defined by the center time +/- N hours. For precipitation requests, the end time is used, and the N value gives the duration.

Point Data Control

☒ River
 ☐ Rain
 ☐ Snow
 ☐ Temp
 ☐ Other

Element: Primary, HA Read, HB Depth, HC Ceilir, HD Head, HE Regul, HG River, HI Stage, HP Pool E, HQ Distal, HT Tailwa

Type Source: Agriculture, Evaporation, FishCount, Ground, Ice

☒ Latest
 ☐ SetTime
 ☐ Min
 ☐ Max

Date/Time: 2002-07-02 14:00
 Hrs: 36

Tabulate Data
 Clear Data
 Map Data

Filter:
 ☐ Data Source
 ☐ Service Area...

Observer: DCP, ALERT

Suppress:
 ☐ Msg
 ☐ Zeros
 ☒ Non-FcstPts

River Basis: Obs

Map:
 ☒ Val
 ☒ Id
 ☐ Name
 ☐ Time
 ☒ Icon

Value

Close

When min or max is selected, the program looks for data with the min or max (as selected) SHEF-based extremum code for the selected duration. The following durations are supported (the min and max codes, respectively, are shown in the parentheses): 1 hour (F,D), 3 hour (G,E), 6 hour (H,R), 12 hour (P,Y), 18 hour (I,S), 24 hour (N,X), one-week (M,W). If a duration is given that does not match one of these durations, then the next lowest SHEF duration is used.

Note that the Ending/Center time text field is multipurpose and used for all but latest time reference option in the manner described above. The time defaults to the top of the most recent hour. Arrow buttons allow adjustment of the time by hour or day increments, or the user enters manually desired date and time. In a similar fashion, the “Hours” text field takes assumes different meanings based upon its use as described above.

4. Data Display

The three buttons labeled “Tabulate Data”, “Clear Data”, and “Map Data” positioned in the center of the Point Display Control GUI provide the user with the ability to control how the point control data is displayed. Tabulate data launches a simple text area gui which lists the point data by the station name, value, time, physical element, type source, duration, extremum code, and, if applicable, the flood departure). This GUI also provides the ability to select a single station’s data and plot its timeseries graph. The user may also print or save the tabulated point data to a file. The “Clear Data” button disables the display of the point data to the viewing area. The “Map Data” button remaps the point data to the viewing area.

5. Point Data Filter Options

The point data filter options include the ability to filter by a specific data source, service area, and whether or not the user wants missing values, zero values, and/or non forecast points included in the final result set. These filter options are all controlled by toggle buttons and can be used in any combination.

When filtering by the station’s data source(s) it is checked to determine whether it has one or more of the selected data source (Observer , DCP , and/or Telemetry Type. When filtering by the station’s service area it is checked to determine if it meets the service area criterion.

6. River Basis Filter Option

This option applies to both tabular and geographical displays. For the display of river data, the user can specify one of three options: the latest observed, the maximum forecast, or the maximum of the two. Note the stage basis only applies for the time mode option of "latest".

7. Map Options

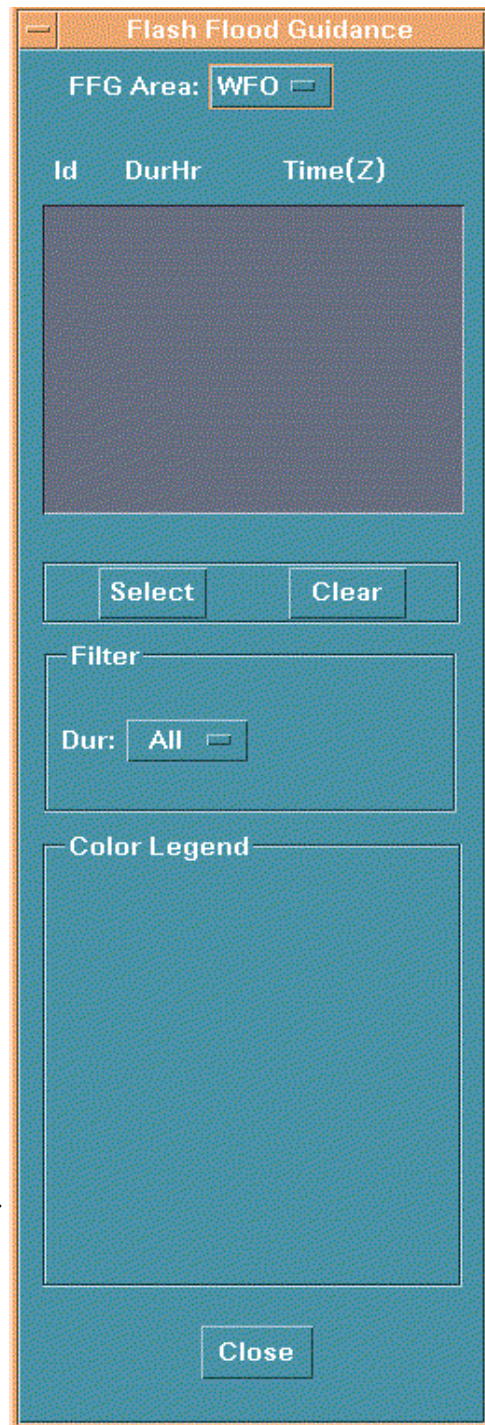
These options only apply to the map display. At most, for each location, the map display shows the station icon, the value of the physical element being examined, the time the physical element was observed or forecast, the location identifier of the station, the name of the location, and possibly a second value for the flood stage. The user can toggle the display of the first 5 items. When turning off the display of the value, the display of any second value is also turned off.

b. Flash Flood Guidance

Hmap_mpe has the capability of displaying Flash Flood Guidance (FFG) grids at either the WFO or RFC level of spatial resolution. The FFG display GUI is accessed from the **Flash Flood Guidance** option under the **LiveData** menu. This simple user interface gives the forecaster the ability to choose FFG data based upon its source and duration. The FFG data is displayed on a HRAP grid.

The areal coverage of the FFG data is chosen by the "FFG Area" option menu button at the top of the GUI. This button offers two choices, namely "WFO" and "RFC", with "WFO" being the default. The "Id" and "Dur" option menu buttons, which are located just below the list box, allow the user to filter by a specific "WFO" or "RFC" FFG product site and duration, respectively. Note that the ability to filter by site is only available for RFC FFG fields. The ability to filter by duration is available for both RFC and WFO FFG fields. Collocated with the duration and id options is the "Display As" option menu. This provides the choice of viewing the FFG data on a HRAP grid or as basin averaged values.

Available FFG data for the user-specified combination of area, creation site, and duration are listed in the list box which occupies the top third of the GUI. Each entry in the list box contains the identifier of the WFO or RFC the FFG pertains to, the duration of time the FFG product is applicable for, and a time stamp ranging from year to minute representing the creation time of the data. FFG data



The screenshot shows the 'Flash Flood Guidance' GUI. At the top, there's a title bar. Below it, a dropdown menu for 'FFG Area' is set to 'WFO'. Underneath, there are three column headers: 'Id', 'DurHr', and 'Time(Z)'. A large, empty rectangular area is intended for the data display. Below this area are two buttons: 'Select' and 'Clear'. Further down, there's a 'Filter' section with a 'Dur:' label and a dropdown menu set to 'All'. At the bottom of the GUI is a 'Close' button. A 'Color Legend' section is also present but currently empty.

may be selected by double clicking on a FFG item in the list box or by clicking on the "Select" button in the middle of the FFG GUI.

Each time a new FFG field is chosen for display, the legend at the bottom of the FFG GUI is updated to reflect the time, origin, duration, and color levels of the data. The FFG product has 9 color levels representing distinct rainfall accumulation categories. These categories are as follows:

Missing
less than 0 inches
0 inches
greater than 0 but less than 1.00 inch
greater than or equal to 1 inch but less than 2 inches
greater than or equal to 2 inches but less than 3 inches
greater than or equal to 3 inches but less than 4 inches
greater than or equal to 4 inches but less than 5 inches
greater than or equal to 5 inches

When viewing FFG data as basin-averaged values, a minimum percentage of the basin must be covered by HRAP bins containing valid, non-missing FFG values. If this minimum requirement is met, then the basin is assigned the average value of the HRAP bins it contains. If this requirement is not met, then the basin is assigned a color indicating that its average FFG value is missing.

FFG data may be cleared from the display by selecting the "Clear" button which resides in the middle of the FFG GUI. The FFG GUI may be closed by clicking on the "Close" button at the bottom of the GUI.

c. Time Series Control

This application extracts data from the IHFS database and allows the user to plot the data in conventional X-Y time series plots, to display data in a tabular time series form, and to perform data editing graphically or through the tabular display. The Time Series Control window has three primary components: the upper section controls the time period being plotted,

Time Series Control

Beginning TimeZ: 2002 06 27 16

Ending TimeZ: 2002 07 05 16

Mode: Station Selection

☒ River ☒ Precip ☒ Temp
☒ Snow ☒ Other

Search: ☒ ID ☐ Name

ACD02	ARCADIA LAKE
ACH02	APACHE
ACIT2	ARCHER CITY (NR)
ADA02	ADA
ADM	ARDMORE APT (ASOS)
ADSO2	ADA AIRPORT (M)
AFW	FTW ALLIANCE AP ASC
AGSO2	AGAWAM ARS

PE TypSrc Ext Dur ACD02

HP	RG	Z	HP=Pool Eleva
HP	RZ	Z	HP=Pool Eleva
QT	RG	Z	QT=Total Discl
QT	RG	Z 1day	QT=Total Di
QT	RZ	Z	QT=Total Discl
PC	RG	Z	PC=Precip Ac
PP	RG	Z Since7AM	PP=Prec
PP	RZ	Z 1hr	PP=Precip In

the middle section controls the options for filtering the list of selectable stations, and the lower section controls what data are being plotted.

The time period is given as a beginning time and an ending time which can be adjusted by the user. The default time period ranges from 3 days in the past to 3 days in the future, based on the current time. All times are defined and displayed as Greenwich Mean Time (GMT) which is the same time representation as Zulu (Z) time. The data are selected in one of two ways, depending upon the selection mode (Station Selection or Predefined Group). To view the set of data that results from the combination of the beginning and ending times, the selection mode, and the filter options of requested data, the user selects the Graph (for generating plots) or Table push button (for tabular representation) at the bottom of the Time Series Control GUI.

1. Station Selection Mode

The user can select a single station from the list of stations by highlighting it. The user may also search for a specific station id or station name by entering it in the text box labelled “Search”. The “Id” and “Name” radio buttons to the right of the search text box control whether the GUI attempts to match the search string by station id or station name. Note that multiple selections are only allowed if they are for the same physical element class.

When selecting the Graph option in the station selection mode, the plot of the time series data is given in one graph on one page. When selecting the Table option in the station selection mode, the tabular time series display window is presented. For the tabular time series display all data types are available regardless of which were chosen on the Time Series Display Control.

2. Group Selection Mode

In this mode a list of predefined time series groups is given. The Graph option allows multiple graphs on multiple pages.

3. Time Series Graph options

The menubar at the top of the Time Series Display window, launched by pressing the Graph button on the bottom of the Time Series Control window, provides six main menu options:

“File”, “PgUp”, “PgDown”, “Graph”, “Options,” “Edit.” The “PgDown” and “PgUp” menu items are push buttons. The rest of the menu items (File, Graph, Options, and Edit) are tear-off menus. These items perform the following functions:

File:Time Series Control - Invokes the Time Series Control Window

File:Save - Saves the image file in .gif format

File:Print:Reverse Video - Prints the screen captured image in reverse color

File:Print:Normal - Prints the screen captured image in normal color

File:Close - Closes the Time Series Display Window

PgDown - Displays the next page of the graphs (the right and up arrow buttons on the keyboard may also be used to perform this operation)

PgUp - Displays the previous page of graphs (the left and down arrow buttons may also be used to perform this operation)

Graph:Zoom:Set - Allows zooming into an area within the graph. The cursor changes into a hand, and the zoom area can then be selected by picking a corner point and then dragging the mouse to the opposite corner of the selected area

Graph:Zoom:Reset - Restores the zoom level of the most recently selected graph.

Graph:Show PC as 1Hr. PP:Interpolate - Displays the PC data as 1 hour incremental data using an interpolation method to fill missing hourly periods

Graph:Show PC as 1Hr. PP:Assign - Sets the display to show 1 hour incremental data by assigning the nearest value to missing hour periods

Graph:Show PC as 1Hr. PP:Off - This option scales the display of OC data as incremental

Graph:Show Latest Forecast Only:On - Enables the filter which causes only the latest time series plot to be drawn.

Graph:Show Latest Forecast Only:Off - Disables the filter which only allows the latest time series trace to be drawn.

Graph:Scale Stages:Data Only - This option scales the vertical axis to fit the data

Graph:Scale Stages:Data Only, Show Categories - This option scales the vertical axes so that the data categories (e.g flood stage) are displayed if they are within the range implied by the data. This is the default option.

Graph:Scale Stages:Data and Categories - Scales the vertical axis so that the horizontal lines for stage categories are always shown

Options:Grid Lines:On - Toggles the grid lines on the time series display “on”

Options:Grid Lines:Off - Toggles the grid lines on the time series display “off”

Options:Plot:Points - Plots the time series trace points. The points are not connected.

Options:Plot:Lines - Draws the time series lines. The actual data points are not drawn.

Options:Plot:Both - Draws both the data points and the lines connecting them.

Edit:Select Trace - Invokes the editing mode. Enables a specific plot line to be selected so that its constituent points may be edited.

Edit:Insert - This option requires that the trace to be edited be first selected using the “Select Trace” option. It allows the addition of a data point into the trace

Edit:Delete - This option requires that the a trace be first selected using the “Select Trace” option. Once this has been done, a point in the trace may then be deleted using this option.

Edit:Move - Once a trace has been selected using the “Select Trace” option, individual points in this trace may be dragged to new positions with this option.

Edit:Save to Database - Once a plot has been modified in the desired fashion, the changes can be saved to the database. Once this option is chosen, the old trace is overwritten and cannot be easily retrieved.

Edit:Cancel Changes - Allows a modified trace to be restored to its original state without saving any of the user's modifications to the database.

4. Time Series Table Options

When the Table push button on the Time Series Control window is pressed for the first time a Tabular Time Series window appears. This window has four primary components: a section which controls which time series data is to be displayed in tabular form, the table itself, a section which allows editing of the time series data, and a section which allows SHEF encoding of the selected data.

When the Table push button on the Time Series Control window is pressed and the Tabular Time Series already exists, the information within the Tabular Time Series window will be updated.

d. Alert and Alarm Data Option

Displays data that have exceeded alert and alarm thresholds based on value and/or rate-of-change quality control parameters. The option menu buttons across the top of the Alert and Alarm Data Values GUI control the data records that are displayed in the large text area. The user has the option to display observed, forecast, or both observed and forecast alerts and alarms. The user also has the option to display alerts only, alarms only, or both alarm/alerts data records. The alerts and alarms may be displayed based upon the value of the data, the rate of change of the data, or both of these limits. The output displayed in the text area may be sorted by the Time of the data or the Location Identifier of the data.

Clicking on an item in the station list will select it and display preset product, alert/alert values, rate-of-change, posting time, and time last reported in the text boxes below. The Tabular Time Series / Graphical Time Series option buttons allow the record to be viewed within its time series context and edit real time data. See the description of the Time Series application above for more information.

Note that the information presented in the Alert and Alarm Data Values GUI is read_only. Changes to data or alert/alarm limits cannot be made.

e. Questionable and Bad Data Option

This window displays all data that have been marked as questionable or bad by the quality control processes. No information or data can be typed or edited in this window except entering the station location, setting the number of days back, and deleting highlighted rows. The "Filter By" option allows the data anomalies list to be filtered by Location (type

the location identifier and press enter) and/or by a certain observation type (click on an observation type in the pull down list). The default is to display questionable or bad river stage values for all locations.

Next to the “Filter By” options is a text entry window which provides the ability to select the number of days back the computer should look in the questionable/bad data list to display data. After entering the number of days back to search, the user must hit the enter key for the search to take place. Finally, the listing of questionable/bad data may be sorted by either the location identifier or the time (starting with the most recent observation).

The header of the questionable/bad data viewing area contains the following information:

Location - location id
PE - physical element
Dur - duration code
TS - type source
Ext - extremum
Value - the observed value
Observation Time - date and time of the observed value
RV - revision or not to the data: T = revised, F = no revision
SQ - SHEF qualifier
QC - quality control code: Q = questionable, B = bad, G = good
Product - product id
Time - date and time of the product
Posted - date and time of the data posted to the database

Within the table the user may click on an item to highlight it and display the quality control data anomaly description. The description can be read in the “QC Description” section below the table. The description gives the user a general idea why the data maybe questionable or bad. At the bottom of the screen the user may view the highlighted item by the “Tabular Time Series” or “Graphical Time Series” buttons. The option “Set Missing” allows the user to change the data from its numerical value to “missing”. Highlighted data rows may be deleted by clicking on the “Delete Selected” button. The “Close” button pops down the window.

f. Rejected Data Trash Can Option

(A manual about this option can be retrieved in PDF format from http://www.nws.noaa.gov/oh/hod_whfs/HydroView/hydroView.htm)

The Rejected Data Trash Can window can be used to display manually or automatically rejected observations, move them to data tables, or delete them from the system. Data that are not removed or deleted from this list are purged by the system after the retention period

has elapsed. This purge parameter is configurable from Hydrobase. The user can filter rejected data by clicking on the “Filter By” options which are arranged across the top of the “Rejected Data Trash Can” GUI. This filtering may be done by the location (which may be done by selecting the “Location” check box and entering a location id in the adjacent text area), the physical element (which may be accomplished by selecting the “Phys. Elements” check box and selecting the element from the adjacent list box) or a combination of the two. In addition to this, the rejected data can be filtered based on whether the report was rejected by a manual process, automated process, or both. The output in the rejected data viewing area may be sorted by location or time (starting with the most recent product time stamp).

The header of the rejected data viewing area displays the following information:

Location - Location id

PE - Physical Element

Dur - duration code

TS - type source

Ext - extremum

Value - observed value

ObsTime - observation time

BasisTime - date and time when a forecast was made for forecast data

RV - indicates if the data has been revised: T = revised, F = no revision

SQ - SHEF qualifier

QC - quality control code: Q = questionable, B = bad, G = good

User - the user id that was used to check the data (awipsusr , SHEFdec)

Type - type of process that checked the data (manual or auto)

PostTime - date and time that data was posted to the database.

Product - product id

ProductTime - date and time of the product

The table displays the list of rejected observations. There are a couple of options in editing the rejected data list. The “Move Selected to Data Tables” button allows the user to move the selected item in the list of rejected data to the appropriate physical element table in the database. The application automatically determines the correct physical element table to insert the rejected report into. Likewise, the data can be deleted individually by highlighting the item and then clicking on the “Delete Selected” button. All items in the rejected data list can be deleted by clicking on the “Delete All” button. A warning dialog will check to make sure that the user really does want to delete all of the data.

g. Station Reporting Status/Latest Observations Option

This GUI reports the status of all of the forecast and observation sites within the HSA. The data is displayed according to the “List” and “Sort” option menu buttons across the top of the GUI. From the “List” option menu, the stations displayed may be chosen according to the latest data for all locations, only those stations with data older than a user-specified number of hours ago, and those stations without any latest data at all. For the option where the user is attempting to display locations with data older than a specific number of hours

ago, the user must enter the number of hours in the “Hours Ago” text area. The display of the data may be sorted by either the location identifier or the observation time stamp.

The large text area below the sort options displays a listing of all of the stations that meet the user’s search criteria. When one of these stations is selected from the list, a listing displaying all of the latest data for the station is shown in the “Latest Data for Selected Location” list box in the bottom half of the GUI. The headings across the top of this box are as follows:

- Location** - location id
- PE** - Physical Element
- Dur** - duration code
- TS** - type source
- Ext** - extremum
- Value** - observed value
- ObsTime** - observation time
- Value** - the value of the decoded Shef product
- SQ** - SHEF qualifier
- QC** - quality control code: Q = questionable, B = bad, G = good
- RV** - indicates if the data has been revised: T = revised, F = no revision
- Product** - product id
- ProductTime** = date and time of the product
- PostTime** - date and time that data was posted to the database.

Below this list box are four non-editable text fields displaying, from left to right, the current time, the period in minutes that telemetry reports are received from the selected station, the period in minutes that DCPs are received from the reporting station, and the starting time in minutes. With the exception of the “Hours Ago” text entry box at the top of the GUI, all of the other fields cannot be edited.

h. Point Precipitation Accumulations Option

This option can be used to display precipitation accumulation data for a set of forecast and observation points. By default, precipitation accumulations are calculated for a 24 hour period ending at 12z of the day the point precipitation accumulation utility is being run. This is performed for all observation and forecast points in the HSA with the output being listed in the large list box that occupies the bottom of the point precipitation accumulations GUI. However, the application offers great flexibility in determining the duration and source of the precipitation data tallied and displayed. An important aspect of this GUI is that data is not displayed until the “Load Data” button is clicked on. This enables the user to retrieve the most up-to-date precipitation data as possible.

The filter options are displayed across the top of the GUI. If the precipitation totals for a single station are desired, then the “Location” check box must be selected with the identifier of the station being entered into the text entry box. The user may select the data source of the PC and PP precipitation observations by highlighting and unhighlighting the data source

names in the “PC/Ctr” and “PP/Inc” list boxes. Control of the duration over which the precipitation estimates are being tallied is provided by the “Endtime/Durs” endtime selection and duration selection boxes. The endtime is the time at which the duration ends. The duration is the amount of time over which precipitation amounts are tallied (1,3,6,12, 24,48, or 72 hours).

In addition to the options to filter by location, data source, and time, the data displayed may be further enhanced by selecting one or both of the two “Options” check boxes. The “Show Details” box, when checked, causes all of the contributing precipitation observations during the duration for a particular station’s precipitation total to be displayed. Each of these reports shows the value for the physical element being processed (either PP or PC), the time of the observation, the duration of the observation (if PP), the extremum code, the data qualifier, and the quality control flag. The “Add PP reports as needed” check box provides a means of supplementing PC type precipitation observations with PP observations.

The displayed point precipitation accumulations may be sorted by location or value in descending order. Across the bottom of the GUI are three push buttons, “Close”, “Save”, and “Print”. “Close” closes the application, “Save” allows the precipitation data to be saved to a disk file, and “Print” allows the generation of a hard copy of the precipitation data.

i. Station Profile Option

This option provides a means of displaying geophysical information and current stage data for the currently selected station and other stations along the same river. The station information and data includes the station identifier with the latest stage and associated time and date, a color coded stage bar, and the actual elevation of the station in feet above mean sea level. A green stage bar indicates a below flood stage river level, a yellow stage bar indicates a river level which is above the action stage, and a red stage bar indicates a river level which is above flood stage. The ordinate (y-axis) of the profile is in feet above mean sea level. The abscissa (the x-axis) is in river miles.

Information for the individual stations along the reach may be displayed through the “Stations” option menu button just below the graphical profile. For a station, its name, reach, action, and flood stages are displayed. Note that none of these fields are editable from this GUI.

j. River Summary

The “River Summary” application provides a means of viewing the river stages of gages/observation points along a single river or stream. This is actually a stand alone application which is launched from Hydroview when the “River Summary” option is chosen. The River Summary GUI is relatively simple, consisting of a list of streams in the upper left, an options box in the upper right, and a graphical river summary across the bottom half of the GUI. When a stream is selected from the “Stream List”, the river summary graphic is automatically updated to display the staff gages of the observation points along the river. These staff gages use green to indicate stages below the action stage, yellow to indicate levels

at or above the action stage but below flood stage, and red to indicate levels at or above flood stage. If the actual river stage data exists, then it is displayed as blue along with its value within the staff gage.

Below each staff gage is the stage value (if no graph is present), the date and time of the observation, the gage identifier/river mile, and the full name of the site. The user has the option of displaying only observed stages, only forecast stages, or the maximum of the observed and forecast stages.

k. Site Specific Headwater Model Option

This is a stand alone application which allows the user to manipulate the rainfall over the head waters of individual streams and rivers. It is an interactive java-based program that enables the user to run a hydrologic model to generate a river stage forecast based upon observed and forecast rainfall amounts.

The main window of the site specific application contains information about the current station being examined and the hydrologic model being used to estimate the river stages. It only has two menubar options, “File” and “Help”. The “File” menu contains the “Quit” option. The “Help” menu contains the “About” option. When selected, the “About” option displays the current release version and date of Site Specific.

Drop down menus across the top of the main GUI allow for the selection of the station and the hydrologic model to use in the computation of the river stages. Below these menus are portions of the GUI which contain station location information and settings for the precipitation analysis time period. Information outlined in the “Station Location Information” portion of the GUI includes the flood stage in feet, the flood flow in cubic feet per second, the UHG peak flow in cubic feet per second, the threshold runoff in inches, and the drainage area of the basin in square miles. Within the “Time Period for Precipitation Analysis” portion of the GUI, the user may select the start time of the 1-hr FFH (Flash Flood Headwater) from the pull down start time menu. The end time of the period may be set by first selecting the time field to modify in the “Modify End time” pull down menu and then using the “+” and “-“ buttons to modify that field in the end time.

Clicking on “Initial Analysis Window” launches a separate GUI containing two graphs. The abissca of both graphs is time. However, the ordinate of the top graph is inches of precipitation while that of the lower graph is river stage in feet. The top plot displays hourly precipitation amounts while the lower plot shows the change of river stage with time *as a function of the precipitation amounts plotted in the upper graph.*

These graphs are a combination of both observed and forecast values. Depending on the duration period selected the time plots will usually include several hours of observed values followed by several hours of forecast values. On the graphs, the current time, which is the division between the observed and forecast values, is shown as a vertical yellow line. Observed river stage values are shown as yellow points while forecast river stage values are drawn as cyan points. A red line representing the flood stage for the site can be toggled on

and off via the “Show Flood Stage” check box. The observed river stage data in the lower plot may be toggled on and off by clicking on the “Show Observed Data” check box.

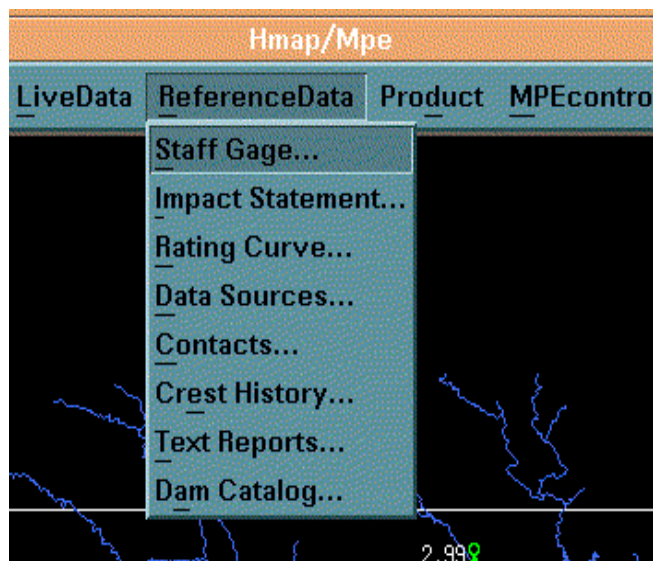
Below the graphs are controls which allow for the modification of hourly rainfall and stage data. The “Edit MAPs” button allows the hourly mean areal precipitation amounts to be modified. The “Edit Stage” button allows the hourly forecast stages based on the hydrologic model to be altered.

The changes made to the forecast river stages may be saved to the database by clicking on the “Save to Database” button which saves this information into the fcstheight table of the ihfs database.

I. Station Selection Option

This option lists the forecast and observation stations for the HSA. Any of the stations in the list can be selected with a simple single click. The station’s name will become highlighted in the list box and a red rectangle will be drawn around the station’s location on the Hmap_mpe display. Only stations that are currently visible on the display are included in the Station Selection list box.

Double clicking on any of the stations in the list will not only highlight the station’s location on the map by drawing a red rectangle around it, but also it will launch the Time Series Control GUI for the station. This will enable the user to tabulate or plot a time series for a specific physical element for the site.



m. Refresh Data Option

This option refreshes the point data displayed on the Hmap_mpe display. This option does precisely the same thing as the timed refresh which automatically occurs after a fixed number of minutes as dictated by the “hv_refresh_minutes” token.

6. Reference Data Menu Options

The reference data options provide useful information about specific observation/forecast sites on the Hmap_mpe display. A station must first be selected on

the map display (either by double clicking on it or by selecting a station in the station list) for the reference data utilities called from the reference data menu to work properly.

a. Staff Gage

This window displays gage background information for a selected station. This GUI is broken up into two main frames, the Reference Frame and the Significant Stages Frame. The Reference Frame contains text fields specifying the name, basin, stream, county, state, lat/lon, elevation, and tidal effects of the site. The Significant Stages Frame contains a drawing of the actual staff gage for the site along with text fields specifying the numeric values of the important stage levels. The graphical staff gage is color coded with green indicating river levels below the action stage, yellow indicating river levels at or above the action stage, and red indicating river levels at or above flood stage. Also, the staff gage indicates the actual values of the action and flood stages along with representative river stages for minor, moderate, major, and record floods.

This display is read-only. Changes cannot be made to any of the text fields.

b. Impact Statement Option

This option displays impact statements for various river stages for a specific site. This interface contains three major components: a list box containing stages in descending order, a characteristics frame containing the stage value, tendency, and begin and end times if the impact statement is a seasonal one (such as at a recreational area). The bottom portion of the Impact Statement GUI is a Text Area displaying the actual impact statement. By selecting different stages in the top list box, the characteristics and impact statement are updated accordingly.

ReferenceData Menu Items (in the order in which they appear on the menu)

- Staff Gage ...
- Impact Statement ...
- Rating Curve ...
- Data Sources ...
- Contacts ...
- Crest History ...
- Text Reports ...

The user has the option to save the impact statements to a flat file (through the “Save to File” button) or to send the entire report to the printer (through the “Print All” button). Note that this GUI is read-only. Any modifications to the data are not saved.

c. Rating Curve Option

The rating curve is a simple utility that demonstrates the relationship between the river’s stage and its discharge. On this graph, the flood stage is illustrated as a red line while the record high river stage is shown as a blue horizontal line. The ordinate of the graph is the stage in feet with the abissca representing river flow in 1000's of cubic feet per second.

In addition to the graph, there is also a simple list box which displays the values of stage and discharge for each of the points used to plot the rating curve. This GUI is read-

only. Changes are not permitted to the text boxes containing the stage and discharge information.

d. Data Sources Option

This popup utility provides a means of browsing the data sources for a selected observation/forecast point. The “Type” option menu button at the top of the GUI informs the user of how the reports are collected and generated for this site. The possible types are DCP (Data Collection Platform), a observer, or telemetry. The GUI reconfigures itself to provide information that adequately describes the type of the data source.

For DCP, the GUI contains a field describing the owner of the data collection platform, the GOES identifier of the product, the reporting time of the platform and how often (the frequency) the platform reports. The GUI also contains any special criteria governing the platform’s reporting of data.

For a observer, the GUI reconfigures itself to display the observer’s name, address and contact information. It also displays information about how the observer reports the observations, who sponsors the observer’s work, how much the observer is compensated, and the task number of the contract that pertains to the observer.

For observations taken by telemetry source (for example, ASOS or a mesonet), the “Data Sources” GUI reconfigures itself to display information about the telemetry source, the owner of the telemetry network, and who pays for the data coming from the network. The cost of the data, the sensor identification string, and the frequency with which reports are issued are also displayed. A telephone number is provided as a source for further information. Any relevant criteria are display in the “Criteria” text area.

e. Contacts Option

The contacts GUI is a convenient display of contact information when there is a problem with an observation site’s data or a special measurement needs to be made during high water situations. The list box across the top of the GUI has the headers “Sequence”, “Contact”, and “Phone”. In this list box are listed any and all contacts, the names of people or organizations that may be called when more information or immediate action is required at a remote site. When one of the items is selected from this listing, the fields in the “Information” frame updates to display more detailed contact details for the selection.

Note that the sequence number is supposed to indicate the order in which people are contacted. Someone with a sequence number of “1” should be contacted before someone with a sequence number of “2”. The “Concerns” field contains special instructions pertinent to the selected contact. Many times, the “Concerns” field will contain after hours contact information for organizations that may only be staffed during the day.

f. Crest History Option

The crest history utility provides a historical lookup of previous floods, their maximum river stage (crest), their flow at the crest stage, the date the crest occurred, and the time the crest occurred. The display consists of a graphic which displays each individual crest with a colored “X” plotted relative to the levels of the minor, moderate and major flood levels. The colors used to represent these three divisions of the flood stage are red, blue, and purple, respectively, and the “X” for the crest is given the color of the stage that it is at or above. Green is used for plotting crests which are below the flood stage

The crests which are plotted on the graph are also listed in the list box in the top right corner of the GUI. When a crest is selected from this list box, it’s corresponding plot on the crest history graph is highlighted in white and detailed information for the crest is displayed in the fields within the “Info for Selected Crest” frame. A crest may also be selected by clicking o its “X” on the crest plot. Which crests are displayed on the plot and consequently in the list box can be controlled through the “Filter Crests By” option below the plot. It offers the ability to display only those crests which are above the action stage, only those which are below the action stage, or all crests. The listed, textual crest information can be sorted in descending order according to stage, flow, or crest date.

The “Info for Selected Crest” frame contains information specific for the crest currently being displayed. This information includes the stage of the crest, the flow or discharge of the crest, the date of the crest, and the time of the crest. The frame also contains check boxes which indicate how the crest observation was arrived at and any additional remarks that may be useful for interpreting the crest.

g. Text Reports Option

The text reports popup utility provides the ability to generate, print, and save to a file three types of reports: E-19, E-19A (Summary), and B-44A (Cooperative). It also provides the ability to create, print, and save to a file a sorted list of the observation/forecast points, a list of station class information, and a sorted list of service backup information. The list of observation/forecast points may be sorted by either the location identifier, the location name, the county, the basin, or the observer. The service backup list may be sorted by the station identifier, WFO, primary backup, or the secondary backup.

The reports that may be generated by this utility may be accessed via the “Report” option menu button. The sorting options are only available for the “Sorted Station List” and the “Service Backup”. For the E-19 report there is a “Page” option menu button which allows quick access to a large number of sections of the report.

The printing and saving of data are respectively controlled by the “Print” and “Save” buttons at the bottom of the application.

h. Dam Catalog Option (This option is not available on Linux)

As of the writing of this user's manual, the dam catalog application is being rewritten as a web based utility accessible from an internet browser such as Netscape. The dam catalog application described below is the old version which is gui-based. When the new dam catalog program becomes available, this user's document will be accordingly updated.

The dam catalog is a stand alone application which provides the user with the ability to list dam information based upon specified search and filter criteria. The main GUI of the dam catalog can be broken down into a list area across the top of the interface which lists dams that have been selected based upon the search, filter, and sort criteria specified in the lower portions of the GUI.

The listing of dam information includes a dam's identifier, its full name, the name of the river the dam is located on, the nearest town to the dam, the state, the county, the latitude/longitude of the dam, the WFO it is covered by, the RFC it is covered by, and the down stream hazard code. The downstream hazard code represents the potential danger to a downstream area resulting from failure or misoperation of the dam or facilities. There are three codes: "L" = Low; "S" = Significant; and "H" = High. Below this dam information list box are five buttons which allow the user to view, edit, add, delete and deselect dam information. Of these buttons, the "Edit", "Add", and "Delete" buttons are only available from Hydrobase..

The search criteria include the dam identifier, the dam's name, the downstream town's name, the county, the state, the hazard level, the RFC, the river, and the WFO. The dam list may also be filtered by specifying a latitude/longitude box, and only dams within this box will be displayed. Once the filter is set, the user must click on the "Apply Filter" button to retrieve the list of dams. The "Clear Filters" button resets the filters to the unset state. The search may be based upon a logical AND of all of the search criteria, wherein a dam will be displayed only if it meets each and every one of the criteria. This type of search is performed when the "Match ALL Criteria" radio button is selected. Or the search may be done in such a way that if a dam meets any one on the search criteria it will be displayed (a logical OR of the criteria). This type of search is performed when the "Match ANY Criteria" radio box is selected. The listing of dams may be sorted according to dam id, dam name, river name, or state/county. When a search is complete, the listing of dams will be updated and the number of dams retrieved will be displayed in the "Number of Dams" text field by the "Unselect All" button.

A dam may be selected from the dam list by clicking on it. To view information specific to this selected dam, click on the "View" button. This will launch the "Dam Information" GUI. This GUI offers five specific categories of dam information: General Information, Physical Dimensions, Reservoir Information, Agency Information, and Dam Break Information. These are selected by the five appropriately labeled radio buttons across the top of the "Dam Information" GUI. By default general information is displayed. This includes

the following information: the name of the dam, a second name for the dam, the dam's latitude and longitude, the name of the river the dam is located on, the town the dam is nearest to, the state the dam is in, the county the dam is in, the county fips, the owner type (federal/public) of the dam, the name of the dam's owner, the type of the dam (i.e., how was it constructed), the dam's purpose, the year its construction was completed, whether or not there is an emergency action plan, the potential hazard posed to downstream communities, whether or not the dam received and passed a phase I inspection, and the dam's last inspection date.

The physical information option on the "Dam Information" GUI displays the following fields of information: the length of the dam in feet, the structural height of the dam in feet, the height of the dam in feet, the hydraulic height of the dam in feet, the volume of the dam in cubic yards, the NID height of the dam in feet, the type of the dam's spillway, the width of the spillway, the number of locks contained in the dam, the length of these locks, and the width of these locks.

The reservoir data on the "Dam Information" GUI contains the following items: the maximum storage of the reservoir in acre-feet, the surface area of the reservoir in acres, the maximum discharge of the dam in cubic feet per second, the drainage area in which the reservoir is located in square miles, and the normal storage of the reservoir in acre feet.

The agency information radio button causes the "Dam Information" GUI to reconfigure itself to display the following fields about the agencies responsible for the Dam and its facilities: the weather forecast office name, the river forecast center identifier, the primary source identifier, the primary source, the state regulatory, the supplemental federal source, the source for federal agency funding, the federal agency responsible for inspecting the dam, the agency responsible for constructing the dam, the federal agency responsible for operating the dam and its facilities, the agency which designed the dam, the agency which owns the dam, the agency which regulates the dam, and the agency which is responsible for other aspects of the dam's maintenance and operation.

The final radio button on the "Dam Information" popup GUI is the "Dam Break Information" button. This includes information tailored toward the event of a dam's failure. Specifically, this gui provides information about a point such as a township or city downstream from the dam. It also provides forecasts for both the dam location and the downstream location for peak water flow and peak water depth for an estimated breach size in the dam that takes a given amount of time to develop. An estimated travel time for the flood wave to reach the downstream location is estimated. Multiple forecasts from different models may be viewed and the output compared. The different forecasts may be cleared, deleted, or changed using the "Clear Forecast", "Delete Forecast", and "View Another Forecast" buttons. The "Save Forecast" button is only available from Hydrobase.

Along the very bottom of the "Dam Information" gui are seven buttons that can be used to control which dam is being inspected. The "Previous Dam", "Next Dam", "Save Dam",

“Delete Dam”, and “Clear Page” options are only available from Hydrobase. The “Close” button popsdown the “Dam Information” gui and the “Help” button displays help text.

7. Product Menu Options

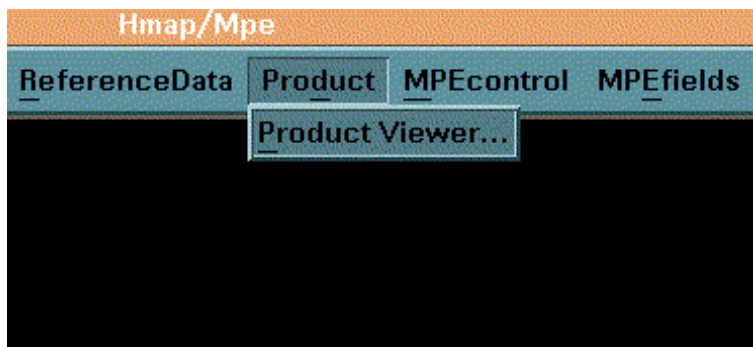
The product menu contains only one option at this time, “Product Viewer”.

a. Product Viewer Option

The product viewer utility provides the ability to view current and past issued products (such as river statements and flood warnings) that have been stored into the database. The

Product Menu Items (in the order in which they appear on the menu)

Product Viewer ...



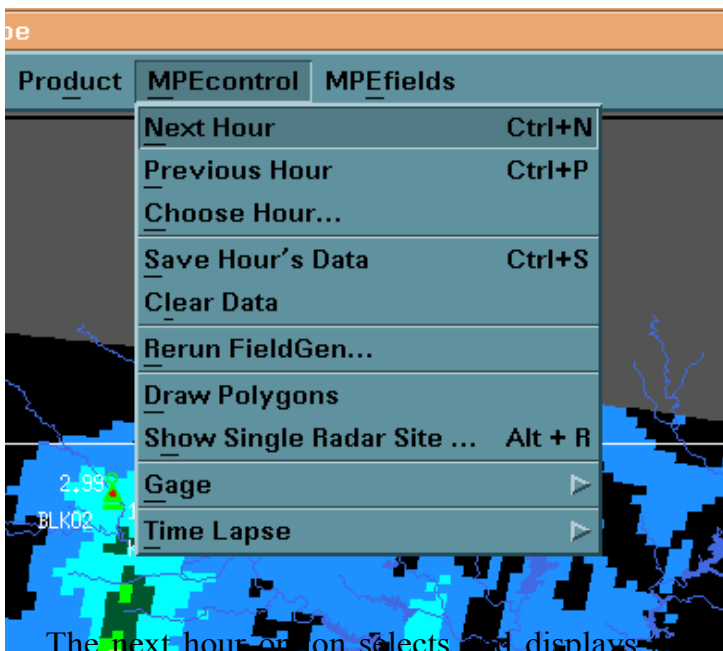
“Product Viewer” GUI consists of a list box containing products that meet the user selected searching criteria. When a product is selected from this list by clicking on it, if it can be found in the database, then its contents will be displayed in the large text area that occupies much of the bottom of the “Product Viewer” GUI. The

products may be displayed according to the three options shown on the “List” pulldown option menu: “Products for Selected Location”, “Latest Product by Product Identifier”, and “Text Products in Database”. The “Products for Selected Location” option relies on a station having been selected by the user before the Product Viewer was launched. If no station was selected, then identifier of the station must be typed into the “Selected Location” text field. If a station was selected on the Hmap_Mpe display, either by double clicking on it or using the station selection utility, then its id will automatically appear in the “Selected Location” text field when the application is started.

The “Latest Product by Product Identifier” option selects the most recent product for each of the available product identifiers in the database. The “Text Products in Database” option displays all of the products that are actually in the database. The output in the product information text box can be sorted according to the product identifier, the product time, and the posting time. Products of a specific id can be displayed by entering the exact identifier into the “Product Id Filter” text field.

8. MPEcontrol Menu Options

The MPEcontrol menu contains functionality which was taken from the original Mpe application and merged into the Hydromap application. The Mpe utilities are treated as being subordinate to the Hydromap application. For this reason, the initial display of the Hmap_Mpe application does not have any Mpe data displayed. None of the MPEcontrol or MPEfields menus are accessible until an hour for displaying the Mpe data has been chosen from the “Choose Hour ...” menu item. Once an hour has been selected the other MPEcontrol and MPEfields menu items are automatically desensitized and made selectable.



The next hour option selects and displays the next hour's worth of Mpe data. The application keeps track of the specific field that the user is looking at so that the same product can be properly loaded for the next hour, producing continuity for viewing the products while making sure that the user does not have to reset the field type every time a new hour is selected.

a. Next Hour Option

For the radar mosaic, mean field bias radar mosaic, local bias radar mosaic, gage-only analysis, multisensor mosaic, and best estimate QPE, when the next hour option is selected and the field currently being viewed has not been saved, a warning dialog box is launched stating that the data has not been saved. This dialog box gives the user the option to cancel the next hour callback and save the data first or to discard any changes made and continue to load the next hour's worth of data.

b. Previous Hour Option

The previous hour option selects and displays the previous hour's worth of Mpe data. Like the next hour option, the application keeps track of the specific field the user is looking at so that the same product can be properly loaded when showing the previous hour's data. Again, this provides continuity for viewing the products while making certain user does not have to bother with resetting the field type every time a new hour is selected.

For the radar mosaic, mean field bias radar mosaic, local bias radar mosaic, gage-only analysis, multisensor mosaic, and best estimate QPE, when the previous hour option is selected and the field currently being viewed has not been saved, a warning dialog box is launched stating that the data has not been saved. This dialog box gives the user the option to cancel the previous hour callback and save the data first or to discard any changes made and continue to load the previous hour's worth of data.

c. Choose Hour Option ...

The choose hour window provides the ability to select a date and a time for which to display an hour's worth of MPE. This window shows a table of allowable hours that may be selected for processing. The number of entries in this table is controlled by the `num_hours_wind` field in the Informix `RWPrefs` table. There are three columns of information in the main window of the choose hour GUI. The first column, labelled "Hour of Run", lists the date/hour to be selected for MPE processing. The hour specified is the end of each hourly period of rainfall accumulation. The second column, labelled "Last Saved", shows the last time that a field was saved for the given hour. If "n/a" is displayed in this column, it means that a field has not previously been saved for this hour. The third column, labelled "Last Input", shows the last hour that the `mpe_fieldgen` process was run for the hour listed in column 1. A "n/a" in this column indicates that a `mpe_fieldgen` run for the hour has not yet been done. The times displayed in columns one, two, and three are in GMT (Z time).

The first date/hour listed in the choose hour window by default is the current date and hour. This can be changed by specifying the date/hour in the form `yyyymmddhh` (Z time) as an argument to the "-t" option on the command line of the call to the `hmap_mpe` application in the `start_hmap_mpe` startup script. This is a change from the MPE application which accepts the date/hour of the historical precipitation event as stand alone command line option without a '-t'.

A date/hour is selected from the "choose hour" window simply by clicking on it with the mouse. To display the data for that hour, simply click on the "OK" button at the bottom of the GUI. The "Cancel" button pops-down the "choose hour" window. The "Help" button launches the Help window which provides help about a variety of `Hmap_Mpe` topics.

MPEControl Menu Items (in the order in which they appear on the menu)

Next Hour
Previous Hour
Choose Hour ...
Save Hour's Data
Clear Data
Rerun Fieldgen ...
Draw Polygons
Show Single Radar Site ...
Gage

d. Save Hour's Data Option ...

Choosing this option saves the currently displayed MPE precipitation field as the best estimated precipitation field for the hour. It is saved as a xmrg formatted file. When a file is saved, a record is written to the Informix RWResult table containing the filename, the id of the user running the Hmap_mpe application (as indicated by the LOGNAME environmental variable), and the date/time that the file was saved. Note that missing values are replaced by 0.0 in the precipitation field before creating the xmrg file. This is done specifically for MAPX, an OFS function which relies on these xmrg precipitation estimates not being missing.

The option to save the best estimate precipitation field only exists for valid precipitation fields. Reference data fields cannot be saved as best estimate data. The fields under the "MPEfields" menu that cannot be saved are the "Radar Coverage", "Height", "Local Span", "Local Bias", and "Prism" fields.

The "Save Hour's Data" option will also save the data in a netCDF format, gif format, jpeg format, or in grib format depending on the values of the "mpe_save_netcdf", "mpe_save_gif", "mpe_save_jpeg", and "mpe_save_grib" tokens in the .Apps_defaults file. When saving gif and jpeg images, make sure that the Mpe main window is on top of the window stack until the confirmation message is printed. Failure to do this will result in creation of an image with other windows obscuring the main window.

e. Clear Data Option ...

This is a new option. Since Hydromap and Mpe are merged applications, it is necessary to provide a way of clearing the MPE data from the screen if the user wants to work solely with the Hydromap point datasets. The "Clear Data" button has been provided to erase any MPE information from the Hmap_mpe display. Note that once this data has been erased, the only way to redisplay the data is to select an new date/hour from the "Choose Hour" menu item.

f. Rerun Fieldgen Option ...

When modifying precipitation and gage data, the user may wish to regenerate all of the MPE fields and ultimately produce a new best estimate precipitation field based on the modified data. An example of this would be if new precipitation polygons are drawn into the radar mosaic field and two new gages are added using the "Add Psuedo Gage" option. To incorporate this new data into the "Field Bias Radar Mosaic", "Local Bias Radar Mosaic", "Gage Only Analysis", "Multisensor Mosaic", and "Best Estimate QPE", Fieldgen should be rerun. All of these fields will automatically be recomputed with the new data for the hour being processed.

A few modifications have been made to the original “MPE” way of rerunning the Fieldgen application. When the rerun fieldgen option is selected, the “Rerun FieldGen Dialog” pop-up shell is launched. Because rerunning FieldGen can be a time consuming enterprise, this dialog box provides the opportunity to abort the attempt to rerun by selecting “No”. Note that if “Yes” is selected, the rerun may take up to several minutes, depending upon the size of the RFC and the load on the system. This dialog also provides the option to rerun the stage II precipitation processor, siipp. By rerunning siipp, the precipitation estimates stored in the procprecip table within the IHFS database are updated based upon the very latest precipitation gage reports. These precipitation estimates are then fed into FieldGen which generates the new grids. While it is very desirable to have the regenerated grids reflect the most recent data, the tradeoff is that rerunning siipp can take several minutes and this coupled with the time needed to rerun fieldgen can amount to more time than the forecaster is willing or able to spare.

Rerunning FieldGen without first rerunning siipp, will normally be fine. Discrepancies may appear between the values of gages on the gage data overlay and the data in the MPE data field being displayed since the gage data in the gage overlay is updated more rapidly than when siipp is run to process it. So there could be a large reported gage value with no indication of such a value in the “Gage Only” and “Multisensor Mosaic” fields.

g. Draw Polygons Option ...

The draw polygons option allows the user to manually draw precipitation areas onto the main window by defining polygons and assigning a precipitation value to each or substituting a precipitation value from other mpe_fieldgen generated fields. The modified field should then be saved.

Precipitation areas may be drawn onto the main window as follows:

- 1) Select the “Draw Polygons” option on the MPEcontrol menu. The program enters the “draw mode”.

- 2) A polygon may now be drawn by using the mouse and left clicking wherever a polygon vertice is desired. To close the polygon, the right mouse button needs to be clicked once. The polygon may only contain 19 points. After drawing 19 points, the polygon will automatically close.

- 3) Once the polygon is closed, the “Edit Precipitation” GUI will appear. This GUI allows the selection of the source of the precipitation data to be substituted into the drawn polygon. These choices include “Radar Mosaic”, “Field Bias Mosaic”, “Local Bias Mosaic”, “Multisensor Mosaic”, “Gage Only Analysis”, “Best Estimate QPE”, and “Substitute Precipitation Value”. The substitute precipitation value option activates the slider bar at the bottom of the GUI. This slider bar allows a specific precipitation amount to be substituted in the polygon.

- 4) Steps 2 and 3 may be repeated several times to draw multiple polygons. Up to 10 polygons may be drawn on the viewing area.

A constraint on drawing polygons is that they must be drawn within the HRAP grid which covers the WFO or RFC area. If the user attempts to draw a portion of the polygon outside of the HRAP grid coverage area, an error dialog will be displayed stating that the cursor is out of range. The user may resume drawing the polygon by selecting a point that is within bounds. Note that in order for these changes to be made permanent, the data field must be saved.

h. Show Single Radar Site ...

The show single radar site option initially brings up the “Radar Sites” GUI. This GUI allows the selection of a specific radar site that provides coverage within the WFO or RFC area. By highlighting a site and selecting the “Ok” button, the “Single Radar Site” GUI is launched. This window has four panes or panels. Going clockwise starting in the upper left hand corner of the window the panes are “Raw Radar”, “Radar Climatology”, “Radar Coverage Map”, and “Mean Field Bias Corrected Radar”.

The “Raw Radar” map is the unbiased radar based digital precipitation product. It is a 131 by 131 km grid centered on the specific radar site. The “Radar Climatology Grid” is the climatological radar precipitation value for each of the grid boxes. Its implementation has been left for a future release. The “Radar Coverage Map” is a map of the radar beam blockages. It is displayed using black and red colors. The black grid boxes are the grid boxes in which there is no radar coverage available due to radar beam blockages. The red grid boxes do have radar coverage available. This information is read from a file in the “misbin” directory. If the file is not available, then the circle will be drawn all filled in. The “Mean Field Bias Corrected Radar” is the raw radar field data values multiplied by the mean field bias value (which is displayed at the bottom of the screen). If data is not available for the selected radar site, then the text “Missing Radar” is displayed within the “Raw Radar” and the “Mean Field Bias Corrected Radar” panes.

The menubar across the top of the “Single Radar Site” window contains the “Control”, and “Options”, and “Overlays” submenus. The “Control” menu contains the “Close” button. This simply closes the single site window. The “Options” menu contains the “Edit Bias Value”, “Ignore Radar”, “Display Adaptable Param”, and “Display Supplemental Data” items. The “Edit Bias Value” option provides the means to alter the radar mean field bias value used to correct its precipitation estimates. It launches the “Edit Bias Value” popup slider bar window through which the mean field bias value can be easily changed. The “Ignore Radar” option provides the means of excluding a specific radar’s data (if for example it is corrupt or bad) from the derived MPE precipitation. Note that for both the “Edit Bias Value” and the “Ignore Radar” options, the “Rerun FieldGen option must be selected so that all of the MPE fields can be recomputed without that radar’s data. For this release, the “Display Adaptable Param” and the “Display Supplemental Data” options are not supported. A future enhancement will allow the ignored radar to be reused.

Finally, the “Overlays” submenu contains the following options: “RFC boundaries”, “States”, “County”, “Cities/Towns”, “Basin boundaries”, “Rivers”, “Precip Gages”, and “Radar Umbrella”. Each of these overlays provides a way of toggling on and off a specific overlay. The overlay selected is displayed or undisplayed in each of the four panes of the “Single Radar Site:” window.

i. The Gage Submenu:

The gage submenu contains the “Add Pseudo Gage”, “Show Gage Table ...”, “Show Gage Identifiers”, and “Show Gage Values” options. These functions operate as follows:

1. Add Pseudo Gage

This option allows the user to add a false (pseudo) gage to the display. When this option is selected, the mouse pointer temporarily turns into a leftward pointing hand to indicate that the application is in “pseudo gage mode”. Left clicking on the portion of the Hmap_mpe viewing area the user would like to insert the new gage brings up the “Add Pseudo Gage” window. This subwindow consists of a slider bar to set the gage’s value and option buttons which allow the user to set the value, to cancel the value selection, and to get more help about the add pseudo gage functionality. Once the slider bar is set to the desired value and the “Ok” button is selected, the new gage is created in the database by inserting a new record into the PseudoGage table. In order to actually see the effects of the new gage on the display, the “Rerun FieldGen” option must be selected. After FieldGen has been rerun, the “Gage Only” and “Multisensor Mosaic” and “Best Estimate QPE” analyses will reflect the new gage. If displaying the gage identifiers, then once FieldGen is rerun, the pseudo gage will have a name like “pseudoN” where N is the number of pseudo gages created for the hour, starting with the number “00”.

2. Show Gage Table ...

The gage table provides a tabular display of all of the gages contained within the WFO or RFC area’s HRAP grid. These are the gages that contribute to the “Multisensor”, “Gage Only”, and “Best Estimate QPE” fields and to the calculation of the mean field bias. This gage listing includes any pseudo gages created by the user. The GUI consists of a simple menu bar with the submenu headings “Control”, “Sort Gages”, and “Help”. “Control” provides the option to quit the gage table. “Sort Gages” provides the ability to sort gages by gage value, by gage identifier, and by radar identifier. “Help” provides access to the help gui. The three columns in the table have the headings “Gage Id”, “Gage”, and “Edit”. Each row in the table corresponds to a specific gage location. The identifier of the gage is listed under “GageID”, the value of the gage is listed under “Gage”, and a new value for the gage may be entered in the “Edit” column. A missing value must be denoted as either “M” or “m”. Note that when “quit” is selected from the “Control” menu, the application automatically searches the edit column for changes. FieldGen must be rerun in order to make the modifications visible.

The main body of this GUI consists of a large table which contains a row for each of the gages contained within the WFO or RFC area's HRAP grid. There are ten columns. These are "GageID", "Gage", "QPE", "Mmosaic", "RadarID", "Rmosaic", "Bmosaic", "Lmosaic", "GageOnly", and "Edit". The "Gage Id" column displays the identifier of the gage. The "Gage" column displays the value of the gage. The "QPE" column displays the best estimate QPE for the HRAP bin that the gage occupies. The "Mmosaic" column displays the multi-sensor precipitation estimate for the gage's HRAP bin. The "RadarID" column indicates which radar umbrella the gage is covered by. The "RMosaic" column shows the radar estimated rainfall for the HRAP bin the gage is located in. The "Bmosaic" and "Lmosaic" columns display the field bias radar mosaic and local bias radar mosaic values, respectively, for the HRAP bin the gage is located in. The "GageOnly" column displays the value from the gage only analysis field corresponding to the gage's location.

3. Show Gage Identifiers

The show gage identifiers option toggles on and off the display of the gage ids on the Hmap_Mpe display.

4. Show Gage Values

The **Show Gage Values** option toggles on and off the display of the gage values on the Hmap_Mpe display. A missing gage value is signified by the value "-999."

j. Time Lapse Submenu

The time lapse submenu contains the following options: "6hr", "12hr", "24hr", "other ...", and "End Loop". The first four options specify the duration of the time lapse. All time lapse durations end with the current hour of data being examined. So, if the 6 hour time lapse is chosen, then Hmap_mpe data for the last five hours plus the current hour are displayed in the time lapse. By default, when started the time lapse begins with the oldest data field and loops to the most recent data field. It then resets back to the oldest data field and loops again to the most recent data field. This process continues until the user ends the time lapse by selecting the "End Loop" menu item, selects manual loop frame stepping, or zooms into or out of the map.

When the "End Loop" option is selected, the time lapse is stopped on the frame it is currently on. To select manual loop frame stepping, the left or right key on the keyboard needs to be selected. The left arrow is for reverse looping while the right arrow key is for normal looping. Pressing the left arrow key will set the display to the current hour's data field. Subsequent left arrow key presses will loop backward in time from there. Pressing the right arrow keyboard button will set the display to the oldest hour's worth of data within the selected time lapse range. Subsequent right arrow key presses will loop forward in time from there. To resume automatic time lapsing the up or down keyboard key needs to be pressed.

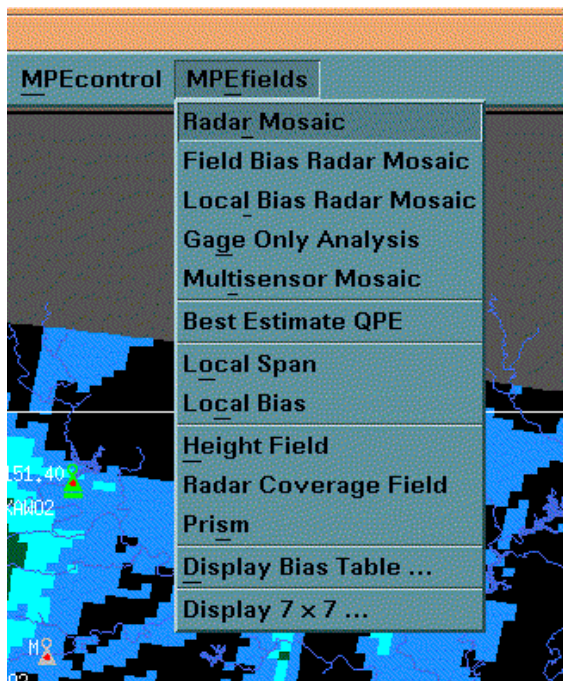
In addition to the “End Loop” menu option, the time lapse may be stopped by either zooming in or zooming out of the time lapsing image. This may be especially useful with the left and middle mouse button zooming capabilities. For instance if an interesting precipitation feature is observed in a particular frame during time lapsing, by placing the mouse cursor over the image and clicking the middle mouse button, the time lapse will stop on that frame and recenter and zoom into that feature. If a left mouse click was performed instead, then the time lapse would stop on the frame and recenter on the click point and zoom out.

The time lag between the successive image displays in the time lapse is specified by the token “hmap_mpe_timelapse”. It is a value in milliseconds. If the token is not set, then the default duration is 1 second (1000 milliseconds).

A time lapse with a duration other than those explicitly shown on the time lapse submenu can be set by selection the “Other ...” option. This launches a gui with a slider bar that allows the duration of the time lapse to be set to any value from 1 hour to 24 hours.

9. MPEfield Menu Options.

These menu options allow the display of the different Hmap_Mpe data and reference fields. The first six field options listed on the menu are observed rainfall estimates based either purely on radar as with the “Radar Mosaic Field”, purely on gage data as with the “Gage Only Analysis Field”, on a combination of radar and gage estimates as with the “Multisensor Mosaic Field”, on biased radar rainfall amounts as with the “Field Bias Radar Mosaic” and the “Local Bias Radar Mosaic”, or best guess based on all of these fields which results in the “Best Estimate QPE” field. The “Local Span”, “Local Bias”, “Height Field”, “Radar Coverage Field”, and “Prism” are reference fields which will be described in more detail below. The “Display Bias Table” option provides the ability display the individual mean field biases for each of the radars providing at least some coverage for the WFO or RFC area. The “Display 7 X 7” option allows the display of a gage point and the 7X7 matrix of HRAP grids centered on it.



a. Radar Mosaic Option

This field represents the rainfall estimate as derived directly from the mosaic of DPA grids for each of the individual radar sites that provide coverage for the WFO or RFC area.

It can also be looked at as the raw radar precipitation estimate. Selecting this option will cause the radar mosaic to be displayed on the Hmap_Mpe screen. It should be noted that for each HRAP grid bin in the raw radar mosaic, the radar which provides coverage at the lowest height above sea level is selected to fill that bin. The “Height” and “Radar Coverage” fields described below are used in determining this optimal radar value for each of the grid bins.

b. Field Bias Radar Mosaic Option

This option displays the raw radar mosaic with the mean field bias applied to it. Each radar site has its own bias value for “correcting” the precipitation. These bias values are viewable in the “Display Bias Table” menu option, discussed more in depth below. The application of the bias value is an attempt to make the radar-estimated precipitation amounts more accurate and reliable.

The bias values are arrived at by comparing ground truth precipitation observations (from gages) with the raw radar-estimated rainfall amounts over ten different spans of time (also known as memory spans) ranging from under an hour, daily, weekly, monthly, seasonal, to period of record.

MPEfield Menu Items (in the order in which they appear on the menu)

Radar Mosaic
Field Bias Radar Mosaic
Local Bias Radar Mosaic
Gage Only Analysis
Multisensor Mosaic
Best Estimate QPE
Local Span
Local Bias
Height Field
Radar Coverage Field
Prism
Display Bias Table
Display 7 X 7

c. Local Bias Radar Mosaic Option

The local bias mosaic is created by computing the bias for each grid box of the HRAP grid that represents a WFO or RFC area. The resulting grid of local bias values is then applied to the raw radar mosaic to produce the local bias radar mosaic. By computing the bias for each HRAP grid bin, it is hoped that local geographical effects on rainfall can be captured. The actual bias value for each grid bin can be viewed with the “Local Bias” field.

d. Gage Only Analysis Option

The gage only analysis represents the precipitation as estimated by gages only. In order to compensate for the generally large spacing between gages, an attempt is made to spatially smooth the precipitation around a gage point. This leads to a sometimes “bull’s eye” like appearance in the data field.

e. Multisensor Mosaic Option

The power of precipitation estimation in Hmap_Mpe is the fact that precipitation estimates from radar and gages may be combined with the mean field bias to create a multimosaic field that provides a best precipitation estimate. This is normally the basis for the “Best Estimate QPE” field, and it is from this field that the user starts making adjustments to make the precipitation amounts even more accurate.

f. Best Estimate QPE Option

The Best Estimate QPE defaults to the multisensor mosaic when FieldGen is initially run to create the MPE data fields (however a new token named “mpe_qpe_fielddtype” has been added to the latest version of FieldGen which allows other fields to be used as the Best Estimate QPE). Using options such as substituting precipitation areas (through the “Draw Polygons” menu item on the MPEcontrol menu) and adding gages (through the “Add Pseudo Gage Option on the MPEcontrol Gage submenu) the Best Estimate QPE field may be easily modified.

g. Multi-Hour QPE

This is a new addition to the Hmap_Mpe application. It provides the ability to display multihour precipitation estimates. At this time, these rainfall totals are derived by summing together the hourly best estimate QPE products. The user is given full control over when and how long to tally these rainfall estimates through a simple GUI.

This feature is accessed by selecting the “Multi-Hour QPE” item on the “MPEfields” menu. This launches the “Multi-Hour Precipitation Accumulation” GUI. This interface is divided into two distinct frames, namely the Accumulation Interval Setup frame and the Accumulation Display Control frame. The Accumulation Interval Setup frame has a drop down menu labelled “Duration:” which allows the user to select the interval over which to sum the rainfall amounts. If the desired duration is not on the option menu, then the user may select Other (at the bottom of the option menu). This will create the “Accumulation Interval” slider bar which allows which allows any interval from 1 to 72 hours to be chosen.

Just below the duration option menu is the ending time text field. This text field specifies the most end time of the interval that multi-hour rainfall totals are being computed over. By default this text field displays the time of the Mpe data field currently being viewed in the main window. However, it may be easily modified through the use of the incrementing and decrementing arrow buttons at either end of the end time text field. The arrow buttons to the left of the text field, labelled “Day Adjust” allow the day portion of the date to be modified. The arrows buttons to the right of the text field, labelled “Hour Adjust”, allow the hour portion of the date to be modified. The user cannot enter a date directly in the text field.

The “Accumulation Display Control” provides the “Display As:” option menu which allows multi hour precipitation totals to be displayed as either HRAP grid values of basin

averages. The “Show Data” button triggers the display of the multi-hour precipitation estimate based on the user-selected duration, ending time, and display resolution (HRAP grid or basins). Below this frame are the “Close” and “Help” buttons which, respectively, destroy the GUI and allow for the retrieval of topic specific help.

When the multi-hour precipitation option is being used, the user may not access any of the items on the MPEcontrol menu. This means that a multi-hour precipitation field cannot be saved as the best estimate QPE, time lapsed, have polygons drawn on it, or have pseudo gages plotted on it. Also, since this product spans a multi-hour interval, the concept of choosing the next or previous hour’s worth of data does not apply. The reason for this is that the Multi-hour precipitation estimate is not one of the base xmrp fields that is saved on disk for future reference. It is simply a displayed product that can be used for reference. In order to regain access to the MPEcontrol menu items, one of the fields other than the multi-hour precipitation estimate must be selected from the MPEfields menu. In this release of the hmap_mpe application, missing values encountered during the accumulation of hourly precipitation totals are not reported to the user. Missing values may be present at a grid bin by grid bin basis or as entire missing fields. Keeping this in mind, it is important to remember that because of missing data, a displayed multi-hour precipitation estimate for a given number of hours may not have been able to find data for all of the hours.

When viewing basin-averaged multi-hour rainfall estimates, each basin must be covered by a minimum percentage of valid, non-missing values in order to be assigned an average rainfall estimate. If this minimum percentage is not met, then the basin is assigned a value of missing and colored as light gray.

h. Local Span Option

The local span field reflects the memory span that is used for computing the local bias of each of the HRAP grid bins. Just as the local bias can be different for each of the grid bins, so is the memory span value different for each of the grid bins. The “Local Span” and “Local Bias” fields are used together to compute the “Local Bias” precipitation mosaic.

i. Local Bias Option

The “Local Bias” field reflects the local bias value for each of the grid bins in the HRAP grid. The span of time (the memory span) over which the local bias was calculated is represented by the corresponding HRAP grid bin in “Local Span” field described above. The “Local Bias” field is used in computing the “Local Bias” precipitation mosaic from the radar mosaic product.

j. Height Field Option

The height field displays the lowest available radar height that provides coverage for a particular HRAP grid bin. If a low elevation radar beam is blocked relatively close to the

radar emitter, then the next higher elevation radar beam is selected in hope that it will be high enough to “see” over the obstacle. If, because of missing radars or ground obstacles, and grid bin has no coverage from any radar, then it is assigned a missing value.

k. Radar Coverage Field

Based on the “Height Field”, the radar coverage field displays which radar site is providing coverage for each HRAP grid bin. The “Height Field” is used in determining which radar location provides the lowest coverage for each of the bins. If no radar is providing coverage for a grid bin, then the grid bin receives a missing value. Ultimately, this field is used in determining the radar biases that are applied to each of the grid bins when computing products such as the “Field Bias” mosaic.

l. Prism

Prism data is long term climatological precipitation data. The multisensor precipitation estimates are scaled by the prism climatologies to improve estimates especially in mountainous regions which are subject to large orographic influences.

m. Display Bias Table

The “Display Bias Table” option launches the “Edit Bias Table” GUI. From here, the user may easily view the radar specific biases for the radar sites which provide coverage for the WFO or RFC area. The three buttons across the top of this GUI, “Close”, “Apply”, and “Help” provide the means for closing the application, applying bias changes, and getting more information respectively. There are five columns of data in this table. Each row in this table provides bias information specific to a particular radar site.

n. Display 7 X 7

The “Display 7 X 7” option provides the ability to look at a 7 X 7 grid of HRAP bins centered on a precipitation gage. This feature, which is a carry over from the original MPE application, is intended to give the forecaster the capability of analyzing the precipitation distribution at a very detailed scale of resolution around a gage site. It also provides the ability to modify the gage’s value. For example, the user may wish to lower or raise the gage’s precipitation amount to make it more consistent with the estimated precipitation amounts in the HRAP bins surrounding it.

When the “Display 7 X 7” option is chosen from the MPEfields menu, the mouse pointer changes to a leftward pointing hand. A gage is selected by positioning the hand over it and executing a single click of the left mouse button. If a gage is directly under the clicked point on the map, then the gage that is closest to the click point is selected as the center of the 7 X 7 display. After clicking on or near a precipitation gage the display 7X7 GUI is launched. This simple GUI contains the identifier of the gage the grid is centered on, the value of the gage, and a 7 column by 7 row table where each element represents the estimated precipitation value of one of the HRAP bins in the vicinity of the gage.

The values displayed in the grid reflect the type of field that the user is viewing in the main window. For example, if the best estimate qpe field is being viewed in the main window, then the values inserted into the 7 X 7 grid will also be best estimate qpe. The colors assigned to the values in the 7 X 7 hrap grid follow the legend displayed with the Mpe product being viewed in the main window.

The Edit button “pops up” a slider bar which allows the user to edit the gage’s precipitation value. Note that in order for this change to be incorporated into the other Mpe fields, fieldgen must be rerun for the hour the gage was edited in. The Close button destroys the 7 X 7 GUI.

10. Help Menu Options

The Help menu displays three menu items: “Help Topics”, “About”, and “Map Legend”. The “Help Topics” item launches the Hmap_Mpe help gui which provides detailed instruction on the use of the features of the application. The “About” item provides the version and release of the Hmap_Mpe application. The “Map Legend” toggle button turns “on” and “off” the MPE data map legend. This is only accessible while viewing MPE data fields.

11. Pop Up Menu Options

A single click of the right mouse button or holding down the right mouse button while the mouse cursor is over the main viewing area will cause a “pop up” menu to be displayed at the click point. This popup menu contains the following options:

In - Zoom the map in.
Out - Zoom the map out.
Recenter - Recenter the map on the point where the user clicks next.
Up - Pan the map up.
Down - Pan the map down.
Left - Pan the map left.
Right - Pan the map right.
Lat/Lon - Turn on or off the latitude / longitude information that chases the cursor.
Mpe Info - Turn on or off the Mpe legend
Timeseries - Highlight the station that was clicked on (if it wasn’t already highlighted) and launch the time series control for it.